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The Foote-Burt Company's Continuous Drilling and Turning Machines

By J. V. Hunter
Western Editor, *American Machinist*

The development of some of the latest machine tools shows the trend in manufacturing methods. The high cost of labor accounts in a large part for the commercial exploitation of these tools, which are now more than ever serving to make every moment of a man's time productive

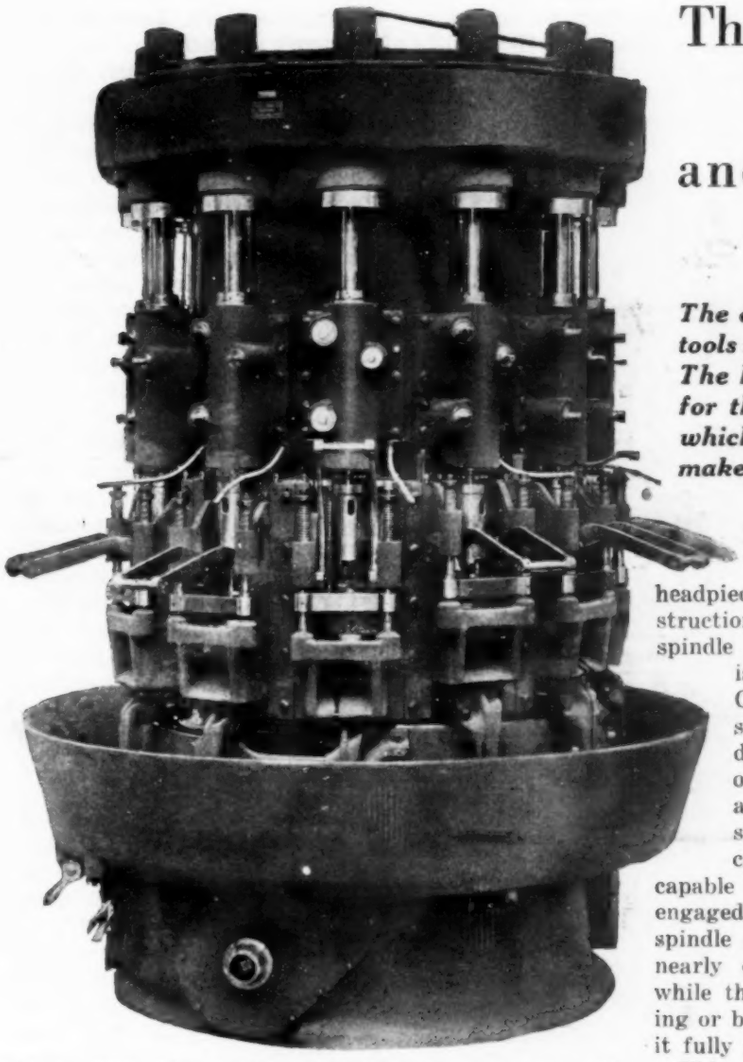

FIG. 1. THE FOOTE-BURT CONTINUOUS DRILLING AND BORING MACHINE

THE ideal manufacturing machine is that in which the operator, without any change of his position, is constantly engaged in placing the work into and removing the finished pieces from the work-holding fixtures. Either the employment of any of his time for tool guidance or loss of cutting time of the machine during idle periods while loading or unloading, adds to the overhead cost of manufacturing.

General attention has recently been attracted to the developments in the line of continuous milling. Machines for continuous drilling and turning operations advance manufacturing methods still further. Some of these are continuous in the true sense of the word, and lose no time while indexing either the work or the cutting tool from one operation to the next.

The Foote-Burt Co., Cleveland, Ohio, is building the line of continuous drilling and turning machines described in this article. These are essentially single-purpose machines, designed to function with precision of movement on either a single or a simple combination of cutting operations.

The machine shown in Fig. 1 which appears as the headpiece of this article, illustrates the type of construction which has been employed. This is a 12-spindle continuous boring or drilling machine which is tended by only one operator. Twelve spindles! One operator! Can the reader realize the great significance of these two points with their productive possibilities and the low labor cost ratio of a machine where one operator can successfully attend 12 working spindles, each spindle constantly producing to the full limit of its cutting capacity? What labor can be found today capable of attending 12 or even four lathes per man engaged in a simple boring operation? The ordinary 4-spindle gang drilling machine reaches the capacity of nearly every operator on single drilling operations, while the operator of this 12-spindle continuous drilling or boring machine does not overtax himself to keep it fully at work.

This machine is arranged to bore out the center of a cone forging for a roller bearing. The cone is forged with a taper on the outside, and after this operation it is cold-swaged so that the outside is cylindrical and the inside is finished to the required cone-shape. This is followed by a simple combination of machining operations, on machines that will be described later, which rough- and finish-turn the outside and face off one end.

Possibly the reader can better understand the operation of this machine, from the statement that everything seen of the machine, Fig. 2, above the chip pan, revolves constantly around an inside center column. In other words, all of the fixtures, spindles and spindle heads which constitute the upper structure of the machine are steadily moving toward the observer's left as he stands before it. When viewed from above the machine, this would be in clock-wise rotation. In operation, the spindles of the machine do not feed longitudinally, but the feed is obtained by a constant rising of a saddle which carries each fixture. This occurs individually as the fixtures proceed in their course around the column of the machine and is governed by the cam *A*, which surrounds the column. The cam has a helical surface on which runs a roller *B* on the inside of the bracket *C*, that forms the lower

portion of the fixture. The work-holding fixture *A*, Fig. 3, is a portion of a saddle which slides in ways *B* finished on the sides of the main superstructure. The saddle is held in place by the gibs *C*. The helical surface of the cam starts and continues the feed while the fixture proceeds in its rotation by constantly lifting the work against the tool until it again comes to the loading station where the feed roller on the fixture reaches a drop in the cam that permits the saddle to fall into the starting position, where it remains long enough for the fixture to be reloaded.

When the feed rollers *D* run onto the "dwell" *E*, Fig. 3, a small secondary roller *F* on the bracket *G* at the same time runs beneath a short cam *H* which pulls the carriage down to its starting position, obviating any chance of friction holding it up. The operator raises the clamping arm *I* on the work fixture, and the springs *J* lift the plate *K* so that a new part can be inserted. The operator clamps the work by pulling the lever down to the position *L* which causes small cams *M* to close the fixture, securely holding the work between the two surfaces. In the position *N* the feed roller has run out of the "dwell" and has climbed onto the main cam surface bringing the work into contact with the tool, thus starting the boring or drilling operation. Unfortunately, neither tools nor work are shown in the illustration.

FIG. 2. SIDE VIEW OF CONTINUOUS DRILLING MACHINE

The spindles have a vertical adjustment of 8 in., making it possible to take care of the wear on the tools, and also to raise the spindle for removal of the tool. To raise or lower the spindle, the two clamping bolts *O* are released and a wrench applied to the square head of the pinion *P* which engages with a rack on the quill. The spindles have upper and lower ball bearings, the lower bearing distinctly showing in this view.

On the bed is mounted a heavy column which carries all of the rotating superstructure or spindle body and the weight of this is borne by means of ball bearings. The spindle body is steadied and held in accurate position by means of long bronze-lined bearings. Ball bearings are an unusual feature in such a position on a machine tool, but it must be realized that the operating and cutting functions of this machine are all self-contained and carried on the sides of the spindle body casting so that these bearings actually have no influence on the quality of the work produced.

Power is furnished to the machine by belt drive to a three-step cone pulley. The spindle head is rotated by a drive from the main shaft through a set of change gears which have further reduction through a worm gear, and this drives a pinion running in an internal gear in the base of the rotating-spindle body. The change gears are provided so that the speed of rotation can be altered if required by the character of the work or the material. The machine as shown is timed for one complete rotation in 110 sec. This indicates that after once being started in operation, its possible production is 392 pieces per hour.

The drive for the spindles is carried up through the center of the column by a shaft, from which suitable gearing connects to all spindles, and these all run continuously while the spindle body rotates. Its rotation may be stopped at any time by means of the control lever *D*, Fig. 2, which of course stops all feed to the tools, although these will continue to revolve until the power is shut off from the whole machine by the lever *E*. This lever disengages a friction clutch in the large end of the cone pulley on the main drive shaft.

The total height of this machine is 8 ft. 6 in. and the diametrical distance from center to center of the work spindles is 48 in., while their chordal center to center distance is 12½ in. The coolant is pumped from a reservoir at the base of the machine to the center of the top and then down into a hollow chamber which runs around the whole spindle-body casting. Holes drilled and tapped into this chamber connect the numerous coolant supply pipes for the spindles. All coolant and chips are collected by the trough about the base of the machine, and after separation of the coolant from the chips the former returns to the storage reservoir.

The lubrication of the machine has been made as near fool-proof as possible. A circulating pump constantly forces oil from a large storage chamber, provided in the base, to the upper portion of the spindle head. The latter is kept full of oil and from each upper spindle bearing a small tube *F* carries a supply

down to the spindle bearings, from which the surplus is drained back into the spindle body by a small overflow hole. The lubrication of the slides must be taken care of by the operator, as it is not practical to have self-lubricating devices on them. When making adjustments on the tools or setting up the machine the operator can turn the column by means of the handwheel *G* which rotates it through the regular gear drives.

The ability of such a machine will be noted for taking care of drilling operations where the drill must pass through two walls of a casting having an intermediate space between them. After feeding through one wall of the casting the cams can give a rapid advance for the interval while the drill is idly feeding through the intervening space and then can again be slowed down for the second cut. This system could be applied indefinitely if there were a large number of short cuts to be made, but the particular adaptations which one could consider for such work would be the drilling of the pin hole through a piston or drilling through two sides of a clevis.

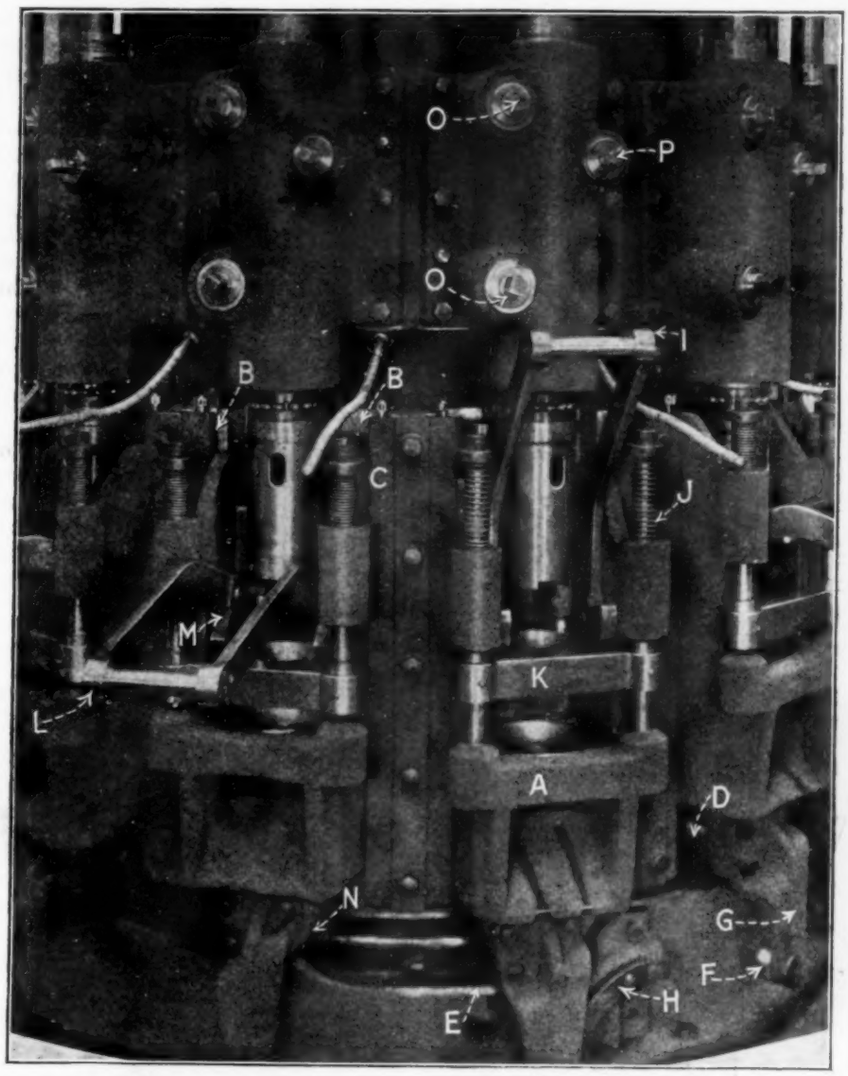

FIG. 3. THE WORK-HOLDING FIXTURES AND DRILLING SPINDLES

In making a study of the turning and facing machine, we find that it is somewhat similar in general appearance as shown by the view of the loading side, Fig. 4, but it differs vastly in many of its operating details. The loading station occurs at a point slightly to the left of the center and at this point the feed rollers descend from the operating surface of the cam into the "dwell." In the drilling machine the tools are revolved by the spindles and the work is stationary, while this machine, in true lathe fashion, carries the work on the spindle and the tools are stationary. The production possibilities of this machine are amazing. It is as though one operator could take care of eight single-purpose lathes each engaged simultaneously on a very short turning and facing operation.

This machine has eight spindles or stations, and each of these constitutes what can practically be considered a complete lathe including the headstock, tailstock, tool carriage and crossfeed slide. The head and tail stocks and crossfeed slide ways have no motion on the column, while the longitudinally fed turning tool is carried on a long saddle which slides in vertical ways corresponding to the bed of a lathe, and is fed upward by a roller acting on the cam surface in the same manner as in the drilling machines.

The illustration of the operating parts of the machine, Fig. 5, shows the spindle at the right empty, with its feed roller *A* just entering the "dwell" of the cam

and its tailstock *B* drawn back to permit the insertion of a fresh piece of work. In the spindle station at the left the tail spindle *C* has been raised, holding the work *D* in place against the cone-shaped section of the headstock which may be seen at *E* on the other spindle. A flange *F* on the upper end of the tailstock spindle comes against the base of the work and rides on a ball-thrust bearing. The tailstock spindle is closed by swinging the handle *G* from left to right, and is then held by a trigger *H* which catches in a small notch and holds it until released by the operator.

On this machine there are two distinct tooling operations. The first is by two tool bits *K* and *L* carried in the block *J*; the upper taking a roughing cut and the lower following with a finishing cut. The reader should understand that the tool feed is governed by the roller *A* which mounts onto the cam *M* from the "dwell" at the loading station, shown in the center of the view. As the spindle column continues its rotation, the roller is constantly mounting on the helical surface of the cam and raising the tool carriage *N* with a constant rate of feed. To remove the chips which might fall on the cam surface before the roller, a sliding, spring-controlled felt pad is provided.

FIG. 4. LOADING SIDE OF THE FOOTE-BURT CONTINUOUS TURNING MACHINE

The motion of the tool carriage *N* also provides the feed for the cross-slide *P*. A diagonal slot cut in the side of the tool carriage guides a roller on a stud on a cross link. When the main tool carriage is lifted, this diagonal slot pulls the link toward the left, causing the toolholder to be drawn in toward the center of the spindle at a constant rate of feed so that its tool faces off the upper surface of the work. When the main spindle head of the machine has completed one revolution and the roller again drops into the "dwell," the reverse motion in the diagonal slot causes the cross-slide to return to its original position. A large notch in the diagonal slot provides a short, quick action to relieve the tool from the work at this time.

The cone-surfaced arbor *E* is provided with a number of steel balls rolling in inclined ways which act at any slippage of the work and rise higher in their grooves, thus locking it more tightly into position. It was found that the use of a plain cone did not prevent the work from turning during the cut, but this method holds securely under all service.

The general internal design of the turning and facing machine is similar to that of the boring and drilling machine, but among a few of the features are the headstock spindles which, like those of a lathe, have no end adjustment. Should it be desired to adapt this machine for other classes of work which would require it to carry tools for such operations as boring or facing where it would be necessary to remove the cone-shaped arbors, a special arrangement has been made for drifting them out of the spindle. The small cover plate *A*, Fig. 6, may be swung to one side uncovering a drift-pin hole in the hollow spindle, from which an auxiliary pin extends to the shank of the tool,

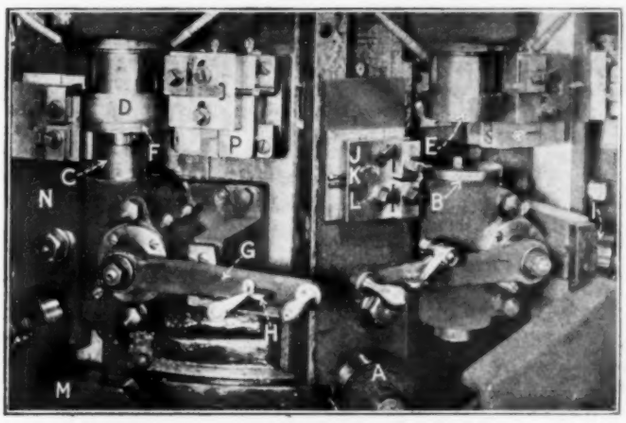

FIG. 5. THE TOOL MECHANISM FOR TURNING AND FACING OPERATIONS

thus affording an aid for its removal when desired. The machine as set up for this operation runs with a spindle speed of 75 r.p.m. and has a tool feed of 0.00975 in. per revolution. The spindle speed is judged proper for this particular piece of work and is geared down from a pulley speed of 300 r.p.m.. At this speed and feed the total time per cycle of the machine is 3.6 min., or 16.6 revolutions of the spindle head per hour. This gives a rate of machine production equal to 132 completed pieces per hour.

The success of the two machines described leads to the hope that they will be more fully developed for application to a variety of work beyond that for which the present ones were designed. There seems to be no doubt but that with the rising cost of labor there will be an increasing demand for machines of this character, where the time of the workman can be constantly employed in handling the work, rather than in waiting for the machine to complete each successive cut. A factor to be considered is that the workman remains constantly at the loading station while the machine is operating, and with modern production methods this enables the arrangement of a shop so that the parts may be brought to him from one side by any of the usual transportation methods, and, after passing through his machine, can be carried away on the farther side by conveyors, thus making production almost a continuous process.

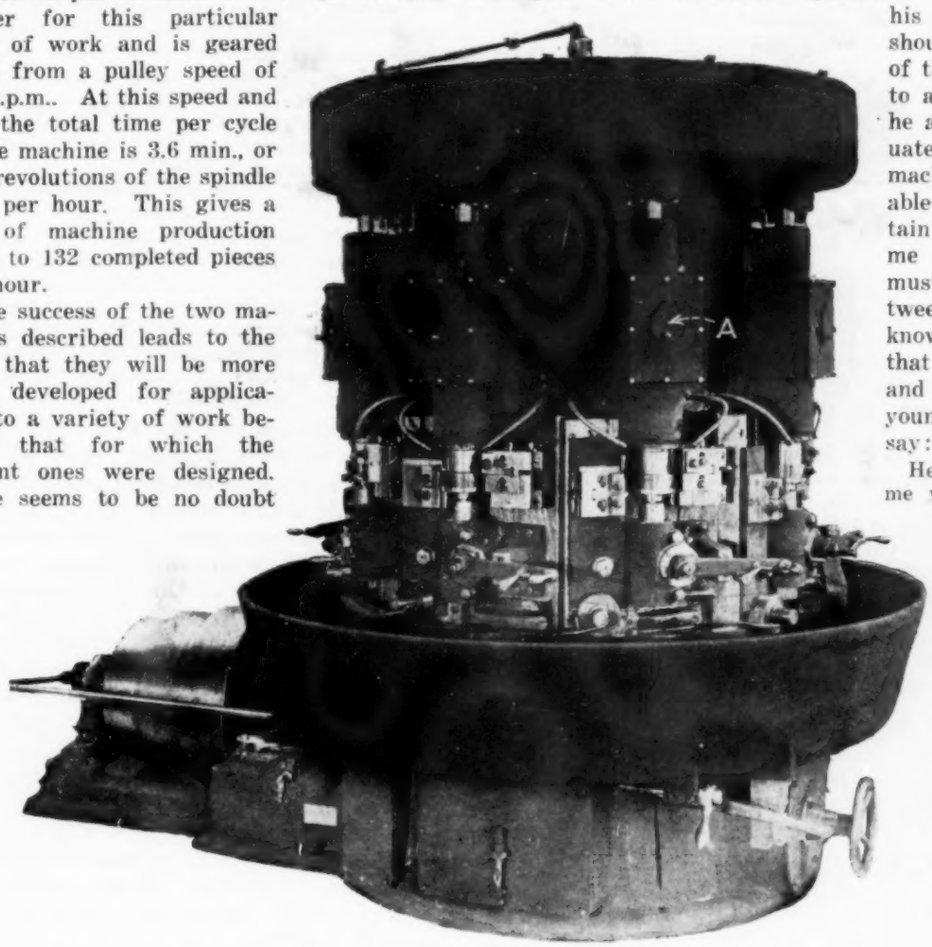

FIG. 6. SIDE VIEW OF CONTINUOUS TURNING AND FACING MACHINE

The Status of the School Shop

By W. D. Forbes

It would seem from what Professor Phillips said on page 650, Vol.. 51 of the *American Machinist*, that I have little respect for professors. If I conveyed that idea I am indeed sorry, for I did not at all mean to reflect on the profession of teaching in my answer to the professor's questions as to the status of craft-school graduates. A man with the experience of Professor Phillips is, to my mind, the ideal instructor and I consider the young men under his direction to be fortunate.

In my letter published on page 122, Vol. 51, I answered Professor Phillips' previous questions, as to whether or not a craft-school graduate should be given credit for his school work and who should determine the amount of that credit; now I will try to answer the other question he asks as to what the graduate should know and what machine tools he should be able to handle in order to obtain a reasonable credit. (Let me say at once that there must be a clean cleavage between what a young man knows and what he can do—that is, between knowledge and skill.) I would take the young man to a bench and say:

Here are some castings. Show me which is cast iron; which malleable; which steel; which composition.

Which of these pieces of bar material is cast, or tool steel? Which is machine steel?

If you were in doubt as to whether a piece of bar material was tool steel or not, how could you satisfy yourself as to its quality?

Do you know what are drill rods? What quality of material is in such rods? Do you know what screw-machine stock is, and how it differs from drill rods?

What are the ordinary market forms of steel, iron and brass usually required in a machine shop?

Do you know that steel tubes can be obtained that are finished bright and quite close to size, both in the bore and the outside diameter?

If you wanted a piece of sheet metal, how would you designate its thickness?

If you wanted a piece of octagon stock, how would you specify the size—measured across the flats or across the corners?

What do you know as to the sizes of ordinary pipe?

Show me a setscrew; a capscrew; a fillister-head screw; a bolt. What usually goes with a bolt that does not go with other kinds of screws?

Has the setscrew more than one kind of end? What condition is usual in a setscrew which is not, as a rule, found in other screws?

How are the sizes of small screws designated? What forms of thread are used in this country on bolts and screws? Are there standard pitches for various diameters of screws? What do you understand by the pitch?

In asking for a screw or bolt, what measurements would you give? Have you ever been warned that half-inch screws and bolts of two different pitches are to be commonly found on the market?

What are the three styles of finish obtainable for nuts? What are the two usual forms of nuts? What is a washer?

How does the threading of pipe differ from that on bolts and screws? Why does this difference exist?

How would you designate a taper pin?

How would you ask for a piece of belting? Can you lace a belt? How have you been taught to run a belt—with the flesh side or the hair side next to the pulley?

Here are a lot of tools: show me a reamer; a tap; a drill; a counterbore; a countersink; a drill chuck; a lathe dog; a drill holder.

Name the several styles of reamers and files you see before you.

What are the two styles of shanks usually on twist drills?

Are there several kinds of lathe dogs? What are they called?

How are the small taper reamers designated?

What are the two styles of fixed gages?

What is an arbor? Point out a surface gage; a depth gage; a thread gage.

What are the names of the three taps that make up a set?

In this set of lathe tools show me a side tool; a diamond point; a half diamond point; a threading tool; a parting, or cutoff tool; a boring tool; an inside threading tool.

Which of these tools is of the proper shape for use on brass or soft metals?

How, and with what, do you set a thread tool?

In this lathe, what are the main parts of the machine?

Throw in the back gearing; set the lathe so as to use the direct drive of the cone.

How do you take out the live center when the lathe has no hollow spindle? How do you take it out when the spindle is hollow? How do you get out the dead center? How do you start and stop your lathe? Can you run the lathe backward? How is this done?

Can you change the direction of the feed; that is, make the carriage run toward the headstock or toward the tailstock? How is this done?

Show me how to set up the lathe to cut a 12-pitch thread. Do you always have to run the lathe back in cutting a thread? How do you tell whether or not you can drop out in cutting a thread?

If the crossfeed screw has a micrometer dial divided to show thousandths, how much would you reduce the piece being turned if you set in the tool two divisions?

If you find that the lathe is turning taper how could you correct the trouble? Do you know what a taper attachment is?

What are the three styles of chucks usually found in a machine shop?

Have you been shown how to swing up a piece by using an angle plate? Why do you have at times to counterweight work when it is swung up?

Do you know what a draw-in chuck is?

When you are to start work on a lathe or any machine tool, what should first be done? How should you leave a tool?

What is the reason that the belts on a planing machine are much narrower than those used on other machine tools? Why is it that such machines usually have no way to change speeds?

When you bolt work on a planing machine, what must be avoided in order to insure that the work shall come out true?

When you take a side cut or down cut, which way must you swing the clapper box to avoid dragging the tool?

Would you rough a piece all over first before taking any finishing cuts? If so, why?

Can you start and stop the platen of a planing machine without handling the belt shipper? How is this done?

What is a "bunter?" How do you use it?

Show me a good tool for roughing cast iron. What name do you give to the stops that govern the stroke of the platen?

In this drilling machine, how do you put on the power feed? Why is a lever feed advisable at times? What is the advantage of the worm feed?

Can you tell me what distinguishes the horizontal from the vertical boring mill? What is it that makes the horizontal boring mill, milling machine, and the drilling machine common as to the cutting tools?

What can you tell me about the grinding machine? On what material is it of special value? Do you know enough of the screw machine to tell me for what class of work it is best suited? Do you know of the flat turret lathe? The slotter? The chucking lathe?

In grinding any hardened tool what must you be careful to avoid?

Tell me how you would harden and draw a tool which is too soft.

Do you know how to use the cutting-off machine?

What causes a power hacksaw to cut crooked?

What is a bolt machine? Can you do any other work on a bolt cutter than threading?

Have you any knowledge of gear cutting?

What instructions have you had as to the speed at which work should be run on various metals?

How are grinding wheels designated?

Can you read drawings? Have you had any instruction in making drawings?

Can you read a micrometer?

Set these calipers to one inch on this scale for a shaft. Set these inside calipers to one inch for boring a hole.

How are scales usually divided?

If you get a set of taps from the toolroom would you ask the toolkeeper for anything besides the taps? Have you been taught the size of drill to use with half-inch taps, or do you ask for a "half-inch tap drill?"

In almost all these questions the point is to get a general idea as to what knowledge the young man possesses and upon what lines he has been instructed.

The answers would not, of course, show the candidate's skill but I think any student should answer all the questions if he had completed his course, and no doubt he could go very much further in showing what he had been taught.

In order to test his skill I would give him drawings, one of which would be a machine-steel shaft calling for several diameters, and one end of which would be threaded. Another drawing would show some faceplate work calling for a bored hole, an internal thread to fit a gage, and faced off. Another drawing would require the use of an arbor.

On the planing machine I would give him a piece of work that required to be squared up on three sides and brought to given sizes. On the milling machine all I would ask would be that the young man finish a key having a head, and square a tap or bolt head with an end mill. I would ask for no work on either style of boring mill but the setting of a piece of work.

All this would show skill, but if the work came out well I would pay very little attention as to the time taken. If the work was done in what I considered commercial time I would add to his credit not in time, but pay. If the questions were satisfactorily answered I would allow 18 months on his four years' time.

Let us have a word from Professor Phillips as to his views on my questions.

Pre-assembly in Ship Construction

By
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U. S. NAVY YARD,
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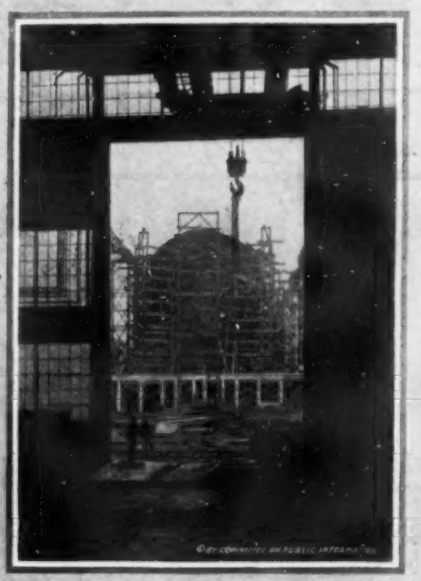


II. Foundations

This completes the data concerning the methods by which a shipyard with only 12 slips is turning out an 8800-ton ship every two weeks.

WATER-TIGHT FLAT. — This is assembled complete with the deck beams, fore-and-aft girders and deck plates. All the work is riveted. The only connections not being on this flat are the staples to shell which are lifted from ship. From bulkhead No. 10 to frame No. 18 these staples form the regulating point and the work is lifted to suit conditions. From frames No. 8 to No. 10, which is inside the afterpeak, these staples are gotten out from the loft and riveted to the flat, holes being left blank to shell. Up to and including hull No. 16, these staples were lifted from the ship and riveted on the ship. This work forms one of the most difficult jobs that could possibly be developed in any shipyard work. It is of such a difficult nature that the best mechanics available can, in very rare cases, make a first-class job. On testing the tank, due to the inferior workmanship which was possible by doing the work in this way, trouble was experienced in getting this tank passed.

BOILER AND ENGINE CASING; UPTAKE COVER AND BULKHEADS NO. 82 AND NO. 84.—These sections are assembled and riveted complete with the exception of bounding angles to the decks. The bounding angles are left loose for fairing up and regulating the casing to the deck. No trouble has been experienced up to the present time by the method employed. The saving on staging alone by erecting this section on the ground has been the means of the early beginning of work in the boiler and engine space, which could only be possible by this assembly.

TRANSOM.—This section is assembled complete including transom bulkheads, floors, frames, beams, shell plates M-1, M-2-3 and M-4, port and starboard. This section is riveted complete. Side frames No. 1 and No. 2 have just recently been put with this assembly and are valuable for fairing up L-1 and M-4 shell plates. See Figs. 13, 14 and 15.

CHAIN LOCKER.—This is a box extending from frame No. 167 to No. 170. The bottom of this box is 18 in. above the second deck. Beginning with the eighth boat this section was assembled, riveted and calked complete. Owing to this box being such a short distance from the deck, the work of riveting was in such a tight place that it could not be performed by the best workmen advantageously. By ground assembly this becomes work that can be performed to advantage, instead of work that is closely difficult.

The foundations are composed of small pieces which become misplaced. To overcome this all foundations are assembled in the shop and sent to the ship in units. In many cases work becomes difficult or inaccessible when these foundations are riveted; consequently, each and every foundation is dealt with separately and only those foundations that do not present obstacles in construction by being in a permanent piece are riveted.

Auxiliary-Condenser Foundation — This foundation is assembled in two pieces and bolted only.

Auxiliary Circulating-Pump Foundation.—These foundations are assembled and riveted complete.

Ash-Hoisting-Engine Foundation.—This section is assembled, bolted and reamed, but not riveted.

Ballast-Pump Foundation.—This unit is completely assembled and riveted, except angle connections to tank top, which are left loose.

Condenser-Pump Foundation.—Same remarks apply as to ballast-pump foundation.

Chain-Stopper Foundation.—Same remarks apply as to ballast-pump foundation.

Evaporator Foundation.—This section is assembled and riveted complete, except two angles connecting to the bilge brackets and angles to the tank top which are left loose for adjusting.

Engine-Room Bilge-Pump Foundation.—This unit is assembled and bolted only.

Engineers Oil-Tank Foundation.—This foundation is assembled and riveted complete, except the three angles which connect to bulkhead No. 70. These angles are left loose for regulating.

Feed-Water-Heater Foundation.—This section is assembled complete, except the four angles which connect to bulkhead No. 83, these angles being left loose for adjusting.

Feed and Fiber-Tank Foundation.—This section is assembled, bolted and reamed only, all connections being left loose for fairing up or connecting other parts accessible.

Feed-Pump-Manifold Foundation.—Material for this foundation is assembled and bolted only.

Fuel-Oil Service-Pump Foundation.—This unit is assembled complete and riveted, except the angles to bulkhead No. 83, which are left loose for fairing up.

Fuel-Oil Transfer-Pump Foundation.—This unit is assembled and riveted complete, except the connections to the bilge brackets and tank top which are left loose for regulating.

Fuel-Oil Settling-Tank Foundation.—This foundation is assembled and bolted together where more than one piece is in a section.

Fresh-Water-Pump Foundation.—This foundation is assembled and riveted complete, except the two angles connecting bulkhead No. 70 which are left loose for fairing up.

Fire and Bilge-Pump Foundation.—This foundation is assembled and riveted complete, except the angles connecting bulkhead No. 83 and tank top angles which are left loose for fairing up.

Gravity-Tank Foundation.—This foundation is assembled and riveted complete.

Lubricating-Oil-Cooler Foundation.—The material for this foundation is bolted together and shipped out as a unit, no riveting being done.

Lubricating-Oil-Pump Foundation.—This foundation is bolted together and shipped out as a unit, no riveting being done.

Main Feed-Pump Foundation.—This foundation is assembled and riveted complete, except the angles connecting tank top and bulkhead No. 83 which are left loose for adjusting.

Main Circulating-Pump Foundation.—This foundation is assembled and riveted complete, except the tank top angles which are left loose for regulating.

Oil-Heater-Bracket Foundation.—This foundation is assembled and bolted together, no riveting being done.

Refrigerator-Machinery Foundation.—The material for this foundation is bolted together and shipped out as a unit, no riveting being done.

Sanitary-Pump Foundation.—This foundation is assembled and riveted complete, except the two angles connecting bulkhead No. 70 which are left loose for fairing up.

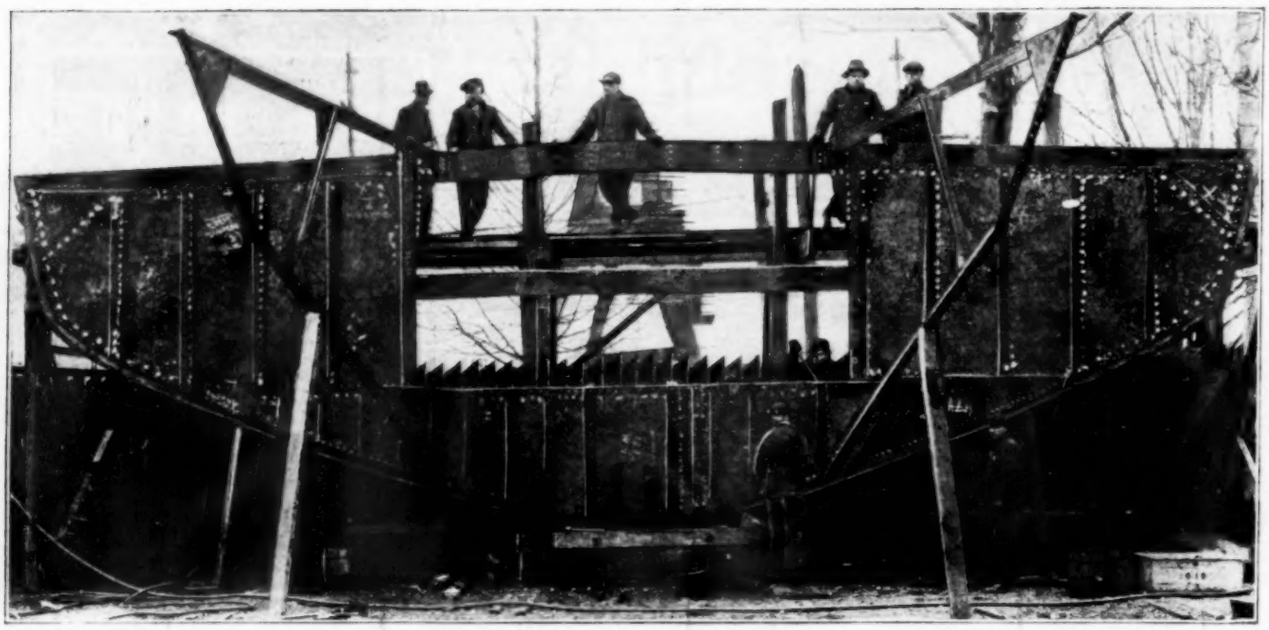


FIG. 13. BEGINNING A TRANSOM

Signal-Light Foundation.—This foundation is assembled, bolted and shipped to the general stores, and then shipped to Philadelphia to be galvanized.

Five-Hundred-Gallon Light Oil-Tank Foundation.—This foundation is assembled and bolted together, no riveting being done.

Inspection-Tank Foundation.—This foundation is assembled and bolted together, no riveting being done and all parts being left loose for regulating.

Settling-Tank Foundation.—All angles and brackets are bolted together and shipped as a unit.

Mast Step.—This is assembled and bolted together.

Main-Condenser Foundation.—This foundation is assembled in 16 parts and shipped to the hull in two different units. Riveting is performed wherever possible. Many small parts are left loose for adjusting; all tank top-angles are left loose for fairing up this section.

Lubricating-Oil Reserve-Tank Foundation.—This foundation is shipped to the hulls loose, except the two plates and the two angles which are riveted together.

Lubricating-Oil Gravity Settling-Tank Foundation.—The material for this foundation is bolted together and shipped to the hulls as a unit.

Lubricating-Oil Discharge-Strainer Foundation.—This foundation is assembled and riveted, except the channels connecting bulkhead No. 70.

Lubricating-Oil Filter Foundation.—This foundation is assembled and riveted complete, except the angles connecting bulkhead No. 70.

Lubricating-Oil Drain-Tank Foundation.—The material for this foundation is bolted together and shipped as a unit.

Cooling-Water Settling-Tank Foundation.—The material for this foundation is bolted and shipped as a unit.

Hand Steering-Gear Foundation.—This foundation is assembled and riveted, except clips connecting upper deck which are left loose in order that the foundation can be properly adjusted, clips riveted to deck and foundations removed until afterpeak tank is tested.

Winch Foundation—Bridge Deck.—The material for this foundation is bolted together and shipped as a unit. Work is left loose for adjustment.

Turbo-Generator Foundation.—This foundation is assembled and bolted together.

Telemotor Foundation.—This foundation is assembled and riveted, except the angles connecting upper deck which are left loose for fairing up.

Main Steam-Casting Foundation.—This foundation is assembled and riveted, except angles connecting bulkhead No. 83.

Landing Support.—Assembled and riveted complete.

Grating Support.—Assembled and riveted complete.

Fire-Room Brackets.—Assembled and riveted complete.

CROW'S NESTS.—These sections are assembled and riveted complete, except the angle which connects to the mast. After assembly, material is shipped from shop to stock until required for assembly with masts.

DAVIT BOXES.—These sections are assembled and riveted complete in shop and are stored until required by assembly yard for fitting on deck houses.

ESCAPE TRUNK—UPPER DECK TO POOP DECK.—This unit is assembled and riveted complete, except the bottom angle which is left loose for adjusting to deck. The section of escape trunk below upper deck is assembled with bulkhead No. 10.

BOOM TABLE AND RESTS FOR MAIN AND FOREMASTS.—These sections are assembled complete, except the bottom angles which connect to the upper deck. The angles are left loose for adjusting and regulating on ship.

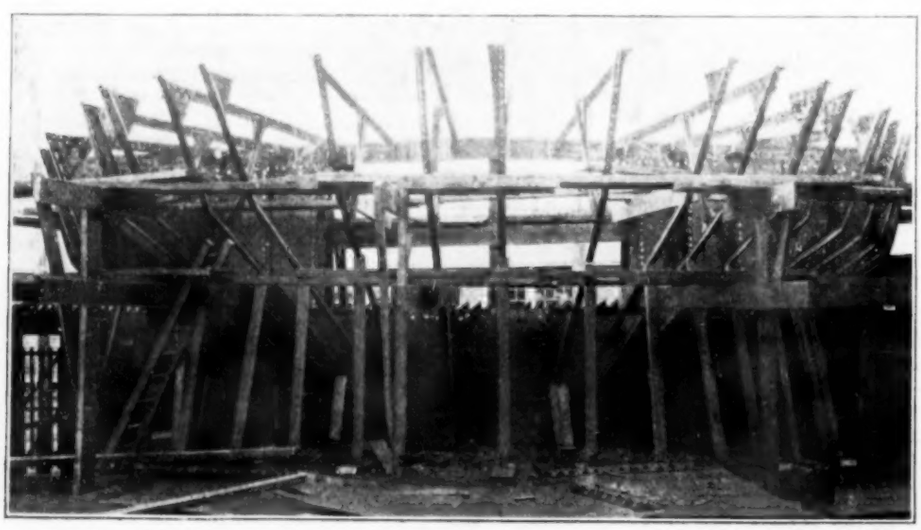


FIG. 14. DURING THE ASSEMBLY

FORE AND MAINMASTS.—These masts are assembled complete with all rings, fittings of all description, ladders, crow's nest and all rigging fitted complete ready for installation. The wood topmasts are fitted complete and the entire mast painted. See Fig. 16.

METAL LADDERS.—All rung and tread ladders are assembled complete. The tread ladders are riveted complete with the exception of top and bottom clips which are left loose for adjusting. Treads are riveted to stringers. Rung ladders are riveted complete.

ENGINE-ROOM SKYLIGHT.—The engine-room skylight is assembled and riveted complete. After completion of this section it is used in conjunction with the assembly of engine-room casing top. Work on the cas-

ing is faired up with the skylight. The skylight is then sent to the wet dock where hatch-cover lifting-gear is fitted in place.

ENGINEERS' WORKBENCH.—This section is assembled and riveted complete, except the angles which connect to the tank top and the two center legs, all of which are left loose for adjusting.

KING POSTS.—All work is assembled complete including electric welding of top plate. Angles to the deck are left loose for fairing and regulating.

FORECASTLE DECK.—This unit is assembled complete with the deck plates, beams, girders and fore and afters. The stringer angle is lifted from the ship and is the adjusting point for fairing up work in this section.

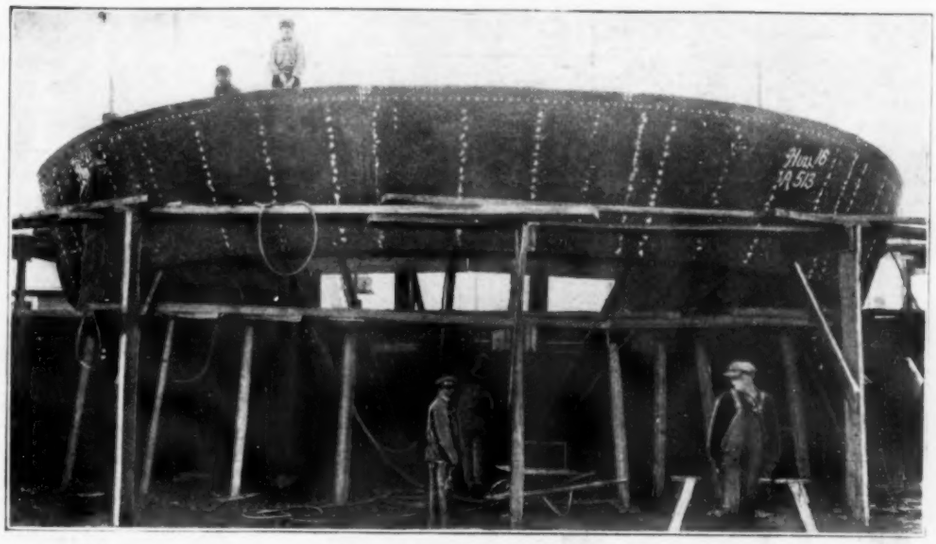


FIG. 15. NEARLY COMPLETED

POOP DECK.—This unit is assembled complete with all beams, fore and afters, deck plating, doublers, skylight coamings and angles. The waterway bars and stringer angles are left off. The stringer angles are left off for adjusting the after end of the ship. The plating is not riveted aft of frame No. 1. This is left loose to properly regulate the work of the transom which is assembled on the ground.

Up to hull No. 17 the assembly of one poop deck plate was included with the transom assembly, but it was found that a better adjustment could be obtained by assembling this plate with the poop deck.

SECOND DECK—FRAMES NO. 10 TO NO. 21.—This section is assembled complete with beams, fore-and-aft girders and angles. All work is riveted except the shell clips which are left loose for fairing up. See Fig. 17.

SECOND DECK—FRAMES NO. 158 TO NO. 169.—The same remarks apply to this section as to the second deck between frames No. 10 and No. 21.

SWASH-PLATES IN DEEP TANKS, FRAMES NO. 93 TO NO. 105, P & S.—These sections are assembled and riveted complete.

SIDE-STRINGERS IN DEEP TANKS, FRAMES NO. 93 TO NO. 105.—This work is assembled complete and riveted.

SECOND-DECK LONGITUDINALS AND HATCH FORE AND AFTERS.—The longitudinal girder in way of second deck hatches is intercostal between athwartship strong-beams at the fore-and-after end of the hatches. The hatches *F* and *A* are intercostal between the same point.

Beginning with hull No. 20 these sections were assembled on the ground with the separator plates. Beginning with hull No. 23 this assembly was completed in the assembly yard and the separator plates riveted. This riveting is very close work on the hulls and was done to much better advantage by ground riveting.

WEB FRAME NO. 99.—This is a new assembly unit beginning with hull No. 21. This web frame, which is additional to the original design, is necessary on account of the shifting of bulkheads in the way of deep tanks. This frame is assembled complete with frame bar, face bars and clips, and is riveted complete, except the two clips and the diamond face plate in the way of side stringer.

BULKHEAD NO. 71—BRIDGE TO BOAT DECK.—This section is assembled and riveted complete with the galley coal box attached which is also riveted. The galley coal box runs only one frame space and is more or less a difficult job to rivet up. The assembly of this unit was started beginning with about the ninth hull.

STACK FOUNDATION.—This is assembled complete with all the connections riveted, except the clips which connect to the casing and which are left loose for fairing up.

FIDLEY TOP.—This section is assembled complete with hatches, hatch covers, ventilator rings, smoke-stack coaming and angles. All work is riveted, except the ventilator rings which are left loose for shipping ventilators.

ENGINE-CASING TOP.—This section is assembled complete, including the engine-room-skylight coamings and angles, galley skylight complete and rings for ventilating trunks. The skylights are assembled separately and fitted to this section for regulating purposes. The skylight, as mentioned before, is then sent to the wet dock for having the skylight training-gear fitted.

ASH CHUTE.—This section is assembled and riveted complete in the shop, except the angle which connects to frame No. 88 which is left loose for shipping.

THREE LONGITUDINAL BULKHEADS, FRAMES NO. 65 TO NO. 70.—These bulkheads are assembled and riveted complete.

WASH-ROOM BULKHEADS, FRAMES NO. 0 TO NO. 4.—These bulkheads are assembled and riveted complete, except the bottom bounding-angle which is bolted to the upper deck

FIG. 16 FORE AND MAIN MASTS

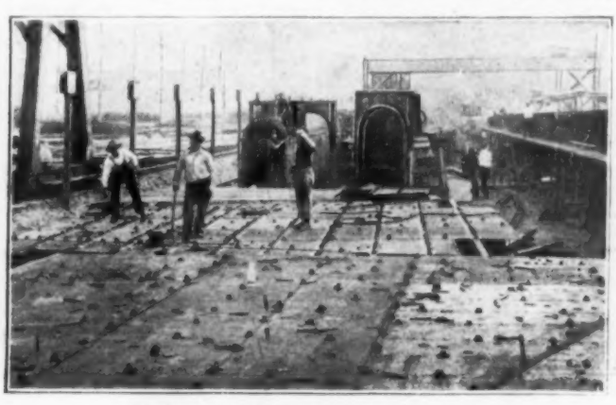


FIG. 17. SECOND-DECK ASSEMBLY

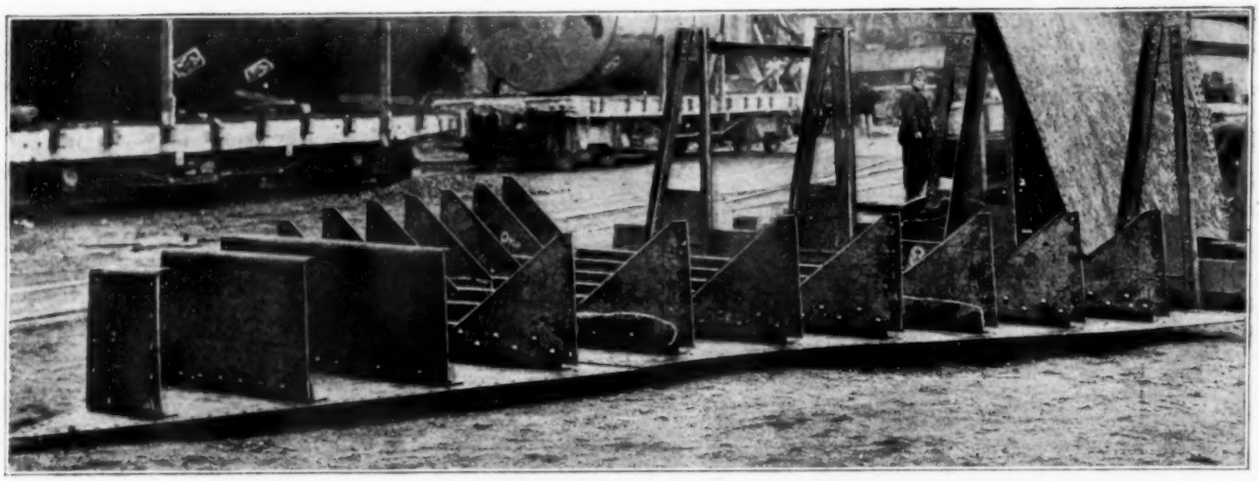


FIG. 18. BEGINNING BOW ASSEMBLY

in order to get an earlier test on the after compartment.

LONGITUDINAL BULKHEADS, FRAMES NO. 67 TO NO. 70, BETWEEN BRIDGE AND BOAT DECKS, PORT AND STARBOARD.—This section is assembled and riveted complete.

BULKHEADS AT FRAMES NO. 166 AND NO. 169, BETWEEN UPPER AND FORECASTLE DECKS.—This work is assembled and riveted complete except bottom bounding-angles.

FRAMES IN THE AFTERPEAK AND FOREPEAK.—The frames in the after and forepeaks have reverse bars fitted. These frames are assembled complete on the ground and bull riveted. Some of these frames are further assembled with other sections which are enumerated in other places.

FRAMES NO. 170 TO NO. 179 INCLUSIVE.—These are all forepeak frames and come below the second deck which is the flat over the forepeak. These frames are assembled complete with second deck beams and brackets, upper and lower stringer beams and brackets and reverse angles; also channel stiffeners which are fitted on every other frame. When forepeaks are assembled piecemeal these frames are assembled, bolted and reamed, and riveting is performed on one side, one side being left loose for adjustment.

FRAMES NOS. 3, 4 AND 6, FROM TOP OF FLOORS TO UPPER DECK.—This unit is assembled complete with upper deck and stringer beams. These sections are assembled primarily for the purpose of fairing up the after end of the ship; that is, holding the shell plating together until it can be properly shored. This section is bolted only, being left loose in order that work in this end of the ship may be faired and adjusted.

FRAMES NOS. 1, 2, 3 AND 4, UP TO UPPER DECK.—These sections are assembled complete with frame bars, floors, reverse angles and connections to upper deck. All work is left loose for fairing and regulating.

FRAMES NOS. 8 AND 9, WATER-TIGHT FLAT TO UPPER DECK.—This section is assembled complete with the frames, upper deck beams and bottom floors which connect to the water-tight flat. All work is left loose for adjustment except the reverse frames to the frames, which are bull riveted.

THE BOW ASSEMBLY.—The design of ship being constructed at this yard permits the assembly of the bow complete in such a way that it can be readily handled and faired up. The main frames cut at the second deck, which is the flat over the forepeak, and the deck plating of the second deck stops at the forward and after side of bulkhead No. 169, making this unit separate and distinct.

In the erection of this unit the following descriptions will show that each step has been carefully considered and the assembly carried along in such a way that regulating and adjusting is permitted.

The second deck, as stated before, extends from bulkhead No. 169 to the stem and is assembled complete with the second-deck beams attached. The main frames are cut at the second deck; therefore, the clips which form the bracket connection of the upper section of frames must be made water tight. Considerable trouble was experienced in the yard on the first 12 hulls in making this section water tight under test, but by assembling decks, work on bracket connections can be performed in an open space where it is possible to obtain the best class of workmanship. This deck is entirely assembled and riveted complete. See Fig. 18. This section is then inverted. By laying the section flat in an inverted position the fairing up and adjusting of all work is simplified to a degree that would be impossible by erecting the frames on the ship, where no definite point can be established without ribbands and shores.

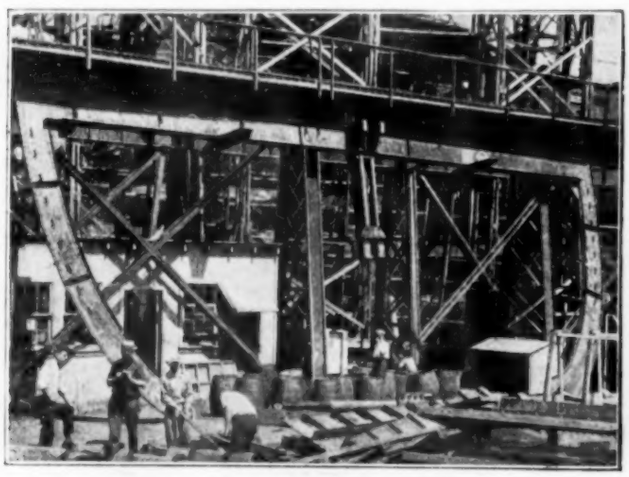


FIG. 21. ONE OF THE WEB FRAMES

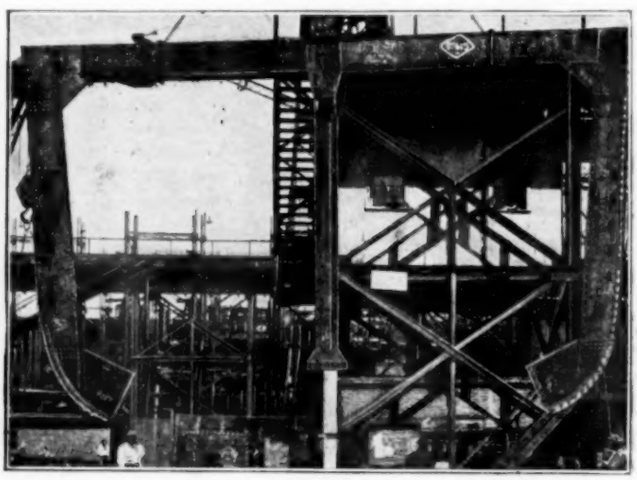


FIG. 22. WEB FRAME ASSEMBLED BY CRANE CREW

The frames are next set in place, having been previously assembled in separate units with the reverse angles and bull riveted; after the bull riveting of the frames is completed they are further assembled with the floors, stringer beams and stiffener stanchions. After the frames are set in place they are properly adjusted and eight shell plates fitted, four port and four starboard. These shell plates form a rigid connection and assure the fairing up of this section. The shell plates are bolted—no riveting being done, in order to take care of slight adjustments which may be necessary when section is erected. Figs. 19 and 20.

The swash plate is next put in place and fitted, then the upper and lower side stringer which has been previously assembled and bull riveted with the exception of shell clips which are left loose.

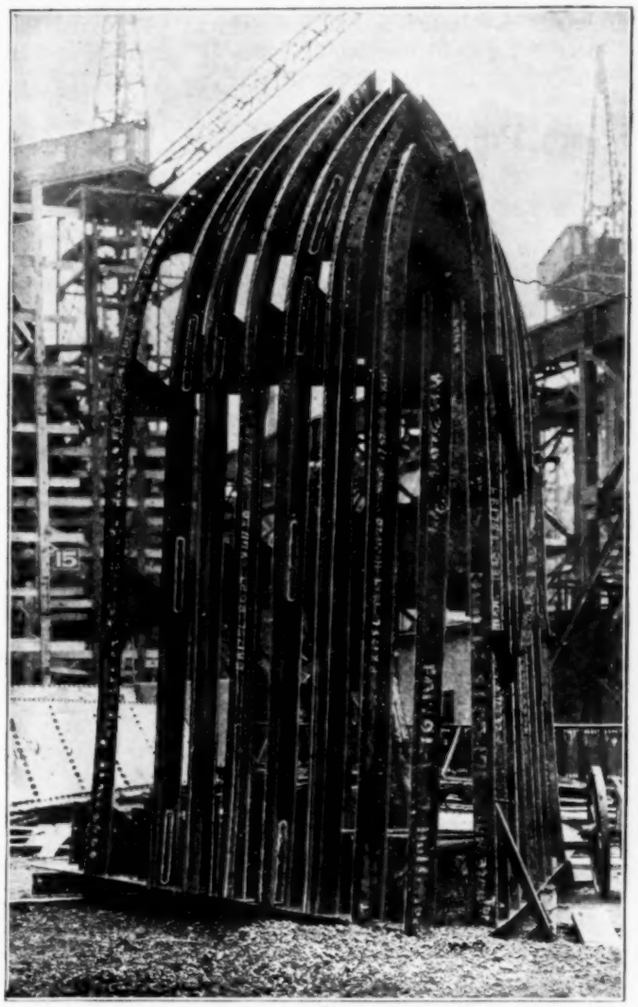


FIG. 19. BOW FRAMES IN PLACE

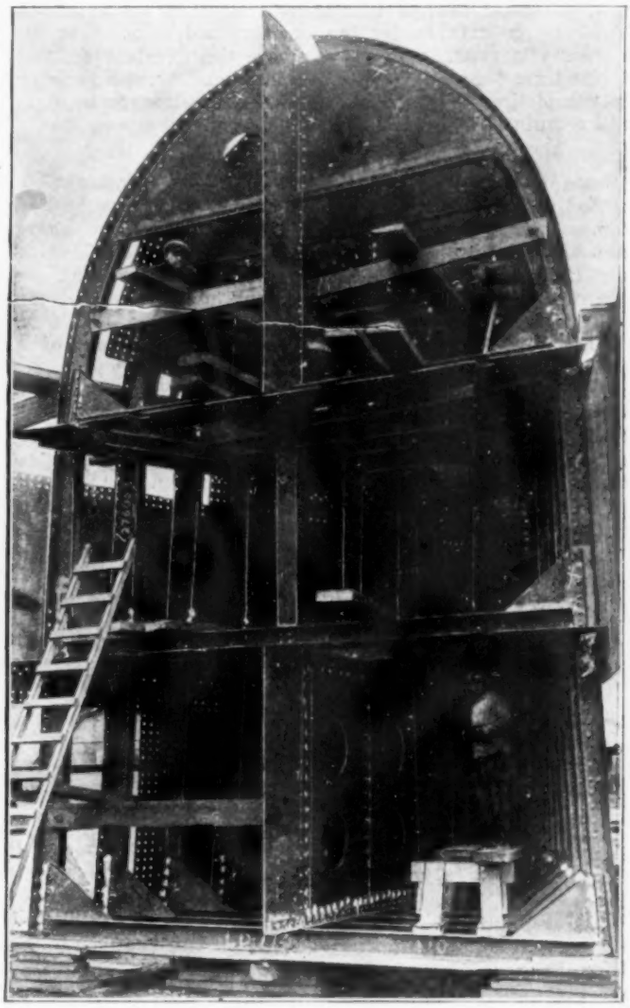


FIG. 20. BOW NEARLY ASSEMBLED

To complete the unit all breast hooks, lower section of stem, forward flat keel plate, intercostals and clips are fitted.

GROUND ASSEMBLY.—The ground assembly in front of all ships is carried on by crane crews. Prior to the launching of a ship the crane crews are not kept busy at all times. The crane crews are reduced to a minimum at this time, but they must be kept on the cranes to take care of lifts required by machinists, shipwrights, carpenters, acetylene workers and occasional lifts required by the hull construction department, but with all this small and miscellaneous work, they are not kept busy 100 per cent of the time. In order to use to advantage this idle time certain assembly in front of the hulls has been introduced.

The assembly of these units, starting approximately six or seven weeks before a ship is launched, has served as a means of furthering the progress of the ship by assembling many small pieces in one large unit which can be readily lifted to the ship, and has been the means of expediting the erection of the ship in the early stages in order to open up work for the trades that follow. In assembling work in this way it can be readily understood that all work put together by crane crews is a saving of time that otherwise would not be possible.

The greatest saving in this respect is the assembly of floors, intercostals, margin plates and bilge bracket clips. This work is assembled complete with the enumerated parts. The size of each section is the length of the margin plate. This gives 14 sections port and 14 sections starboard for the entire assembly of the bottom of the ship. Up to hull No. 16 a great deal of trouble was experienced in pulling up the floors and margins, but this has been entirely overcome by the assembly just referred to. It is accomplished by fitting the bilge bracket clips on the ground and pulling this work up tight before it is erected. Any small discrepancies, which are never more than $\frac{1}{4}$ in. can be made up on the clip connection to the vertical keel. This has proved successful and is eliminating almost entirely the cutting out of rivets on the outboard clip connecting floors to margin plate.

The next most important of these ground assembly units and which comes along at a later stage in the erection of the ship, is the web frames, strong beams and stanchions, Figs. 21 and 22. The ground assembly of these units comes along at a time when there is a lull in the erection aboard ship; that is, just after the completion of bottom shell plates, floors, tank top, bilge plates, etc. These units are assembled in one piece and bolted; when ready for erection on the ship they are picked up in one piece.

The saving in this class of erection is the turning of idle time into productive time. It is always necessary in the erection of a ship only to erect to a certain point, and at this point erection must cease until other trades have completed their work.

The shaft alleys which are assembled in the assembly yard are further added to by having stanchions and diamond plates fitted by the erectors in front of the hull.

It is intended that when opportunity and suggestions develop this method of assembly be increased. It should be particularly noted, however, that there are only certain units that can be advantageously handled by the erecting crew, it being always borne in mind that no assembly should be undertaken by the erectors unless it is to fill in their idle time. The point where the greatest amount of idle time occurs is just prior to a launching, and after the completion of the tank top when erection is held up until certain riveting is completed.

A Ship Every Two Weeks

Some idea of the success attending this pre-assembly method and its practical value to shipbuilding may be had from a consideration of the fact that within two years from the time ground was first broken for this plant of only 12 slips, 8800-ton ships were being delivered at the rate of one every two weeks. About 30 per cent. of the total tonnage of each vessel is pre-assembled and over 70,000 rivets are driven on pre-assembled units out of a total of 500,000 rivets in each hull. The saving in riveting alone is estimated as well over $3000 per hull. The average drive for all assembly work is approximately 100 rivets per hour per gang, which has never been obtained as an average on board ship under any conditions or circumstances.

The other advantages claimed for this pre-assembly practice are:

1. Saving in staging.
2. Work accessible sooner to all trades.
3. Lower priced and smaller number of men in gangs handling material.
4. Possibilities of specialization.
5. Reduction of time on shipways estimated at not less than 15 per cent.
6. Earlier delivery of ships permitting vessel to be placed on an earning basis sooner.
7. Total saving in labor while on ways of from five to eight per cent.

A Kink in Indexing

By A. R. Durant

A simple and reasonably accurate scheme for indexing work to divisions not provided for on the regular index plate is here described. No special index plate or gearing is necessary and no change need be made in the dividing head.

Select a circle on the regular index plate which, if the number of holes was increased two, three or four times, would figure right. A small templet, or gage, is made, which, when placed over one space of the index circle selected, will divide that space the number of times required. The advantage of a high-number circle is thus obtained.

The templet may be made of ¼-in. stock, ½ in. wide and long enough to cover two adjacent holes of the circle selected. Two points are located on one side, by lightly spotting through these two holes in the index plate with a twist drill.

The spots are now connected by an arc corresponding to the radius of the circle. Next, this arc is carefully divided into the number of parts by which the circle is to be multiplied. Holes to fit the index pin are drilled as accurately as possible at the division points, and another hole is drilled through one of the spot marks. A small stud the same diameter as the index pin is fitted to this latter hole, projecting about $\frac{3}{16}$ in. from one side of the templet.

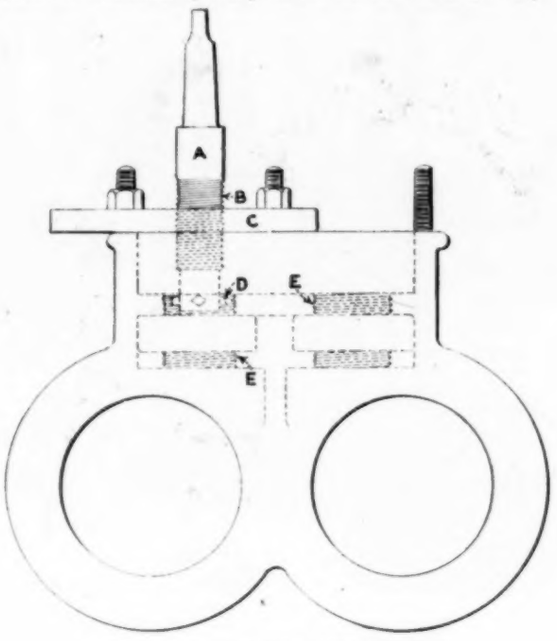
To use the device, each division of the index circle is counted as two, three, or more spaces as the case may be, and the handle moved to the last regular hole possible. From this hole the movement is continued by placing the stud of the templet in the hole and moving the index pin to the proper subdivision of the templet. Further indexing is continued from this point and the templet moved around as necessary.

For example, to cut a gear of 51 teeth, use the 17-hole circle and divide the templet into thirds. Figuring the 17-hole circle as 51, the handle must be moved 40 spaces (40/51); or, as a 17-circle, 13¾ spaces (13¾/17).

Steam Pump Repaired by the Aid of a Drilling Machine

By Winthrop D. Washburn

The illustration shows an outline of the delivery end of a Worthington steam pump which was repaired by the aid of a drilling machine and a little ingenuity on the part of the man in charge. The valve mechanism is retained by the threaded holes *EE* and, as these are subject to corrosion, they have to be occasionally removed. This article describes a method of cutting new threads, using a drilling machine and no other mechanism excepting the threaded plate *C*.



METHOD OF REPAIRING PUMP

The bar *A* is turned on the upper end to fit the drilling-machine spindle and also threaded at *B* with the suitable thread to act as a guide for the threading tool. The plate *C* is threaded to fit the bar *B* and is held in place on two studs as shown. The lower end of the bar carries the threading tool *D* which is held in place by a setscrew. As shown, this is held by one screw and fed into the work by tapping on the back end with a light hammer between the cuts. By making this tool short, so as not to extend clear through the bar, a setscrew can be placed behind the cutting tool and used for feeding it into the work. This allows the holes to be easily threaded and the job can be done in a short time with a very limited shop equipment.

Adjustable Trimming and Shaving Dies

By FRANK A. STANLEY

Reference has been made in earlier articles regarding the possibility of using trimming dies for cutting blanks of uniform pattern to different lengths in order to save duplication of blanking dies for each and every different size of piece in a series. An illustration of this principle is contained in the views that follow, which show the method of blanking, trimming and shaving a set of nine steel cams for a calculating machine, these cams varying in length throughout the group of nine parts. Only one set of blanking tools is required, and one second-operation die accomplishes the trimming and shaving of the entire lot of cams.

THREE of a set of nine cams for a calculating machine are shown in detail in Fig. 1. The range for the cams is from 50 deg. down to 10 deg. as measured from center to point of throw. The cam ends at the arc *A* are all alike and this arc is struck from a radius of 0.570 in. in all cases. This makes it possible to utilize one trimming die for all sizes of cams, as the portion operated upon in finishing the blank is uniform throughout the series of cams.

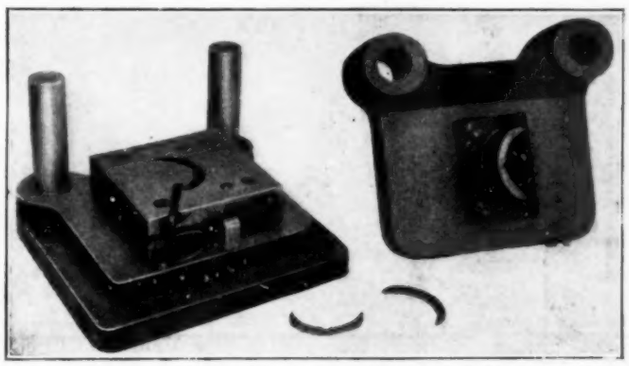


FIG. 2. BLANKING TOOLS FOR CAMS

The blanking tools are shown in Figs. 2 and 3 and the latter shows the method of locating the stock gage so that it drops into the opening in the scrap immediately ahead of the blank that is being punched out. The stop is of the trigger type with projecting end for operation by the adjustable striking screw in the punch head when the latter descends. At the right is a spring-actuated pressure finger for holding the heavy stock closely to the back guide under the stripper. It will be noted that this stock is 0.120 in. half-hard steel.

The trimming dies (which are also used for the shaving operation) are shown by Figs. 4 to 9 inclusive. In the first of these views the entire series of nine cams of different lengths are shown in the foreground, and the locating nest is seen empty with three knock-out pins projecting slightly above the bottom of the work seat just as they are thrown up by the handle in front when the trimmed cam is ejected. In Fig. 5 the middle length cam, No. 18 as it is called, is seen in position in the nest which is here shown adjusted to central position. In the preceding view, Fig. 4, this locating nest is seen at the extreme right-hand position or in the place in which it is set for the longest cam of the series, namely, No. 14. In Fig. 6 the graduations at the front of the die for giving the nine positions for all of the cams may be plainly seen.

It will be gathered from these views that this die is arranged to give the ends of all cams the same form; but each number of cam is cut to a different length from the other cams in the series, so that more metal is trimmed off from some cams than from others, the amount removed varying with each cam member.

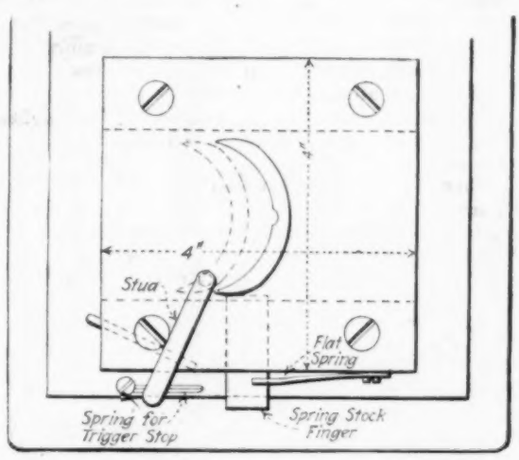


FIG. 3. DETAILS OF BLANKING DIE

Referring to Fig. 7, there is shown at *A* a half-round lug on the locating device *B* that is used for positioning all lengths of cams from the similar notch blanked in their concave sides. When the adjustable nesting device *B* is set by the front graduations *C* to the right position, the cam placed in the nest will be cut off to correct length and form. After the entire lot for one length of cam has been

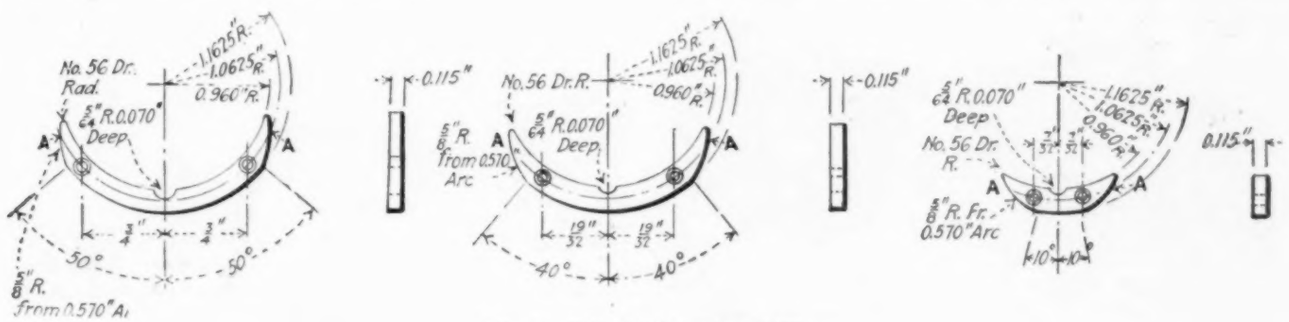


FIG. 1. THREE OF THE CAMS

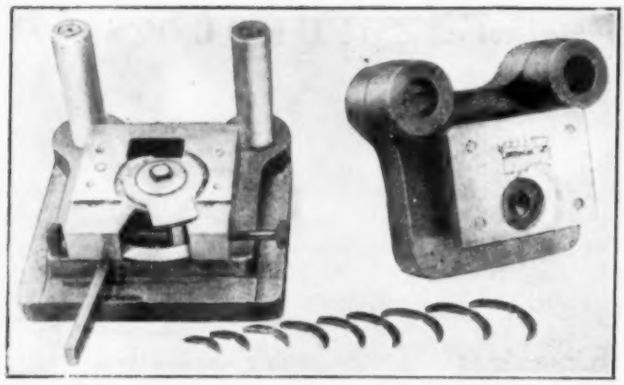


FIG. 4. THE DIES AND THE CAMS

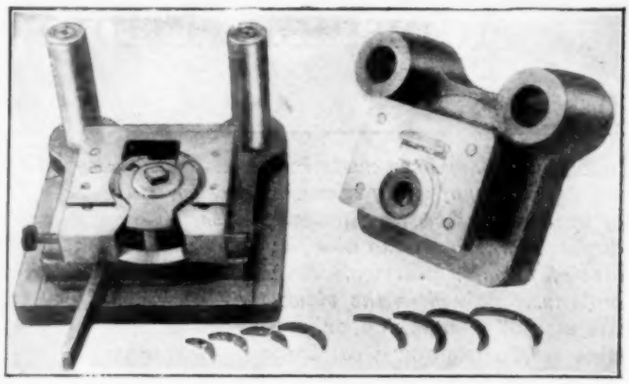


FIG. 5. THE DIES WITH A CAM IN POSITION

trimmed, the device *B* is reset to another graduation and the next length trimmed, and so on. This is brought out by the sketches, Figs. 8 and 9, which show the settings for two cams, one long and one short, and indicate the amount of movement of device *B* in the change from one cam to the other. The intermediate settings are all established by the graduations on plate *C*.

The Cutting Edges

The front end of any cam trimmed in this die is located against the stop gage *D* and as the blank cam rests closely in the circular channel or nest *E* with its half-round notch over the lug *A*, the work is well secured against shifting under the cut. This notch, by the way, is the locating medium for the finished cam when assembled in the calculating machine, hence the importance of finishing all ends from this central point is emphasized. Both ends of each cam are trimmed alike, the blank being turned over for the cut on the opposite end.

The trimming punch has only a short length of cut but is itself of liberal proportions for rigidity. It fits at the back and sides in the oblong die opening which acts as a further guide for retaining the punch in alignment. The back of the punch as indicated at *F*, Fig. 7, is ¼ in. longer than the face so that it has an opportunity to become well located in the die opening before the cutting edge strikes the work. The punch is inclosed in the spring-controlled stripper and pressure pad *G* which holds the blank firmly during the trimming operation.

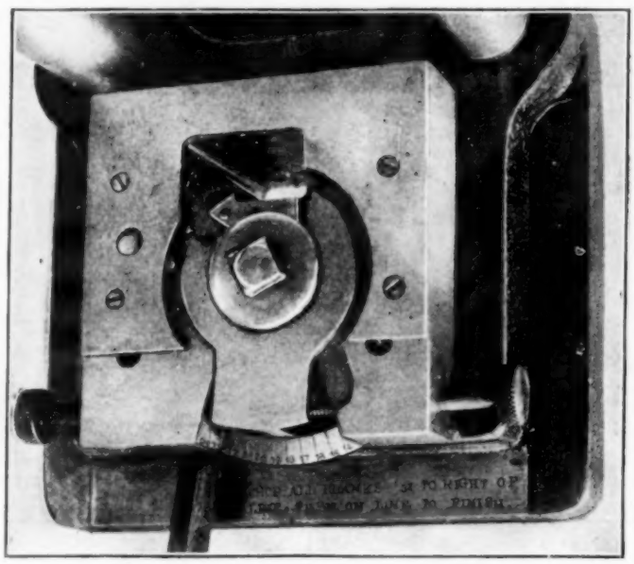
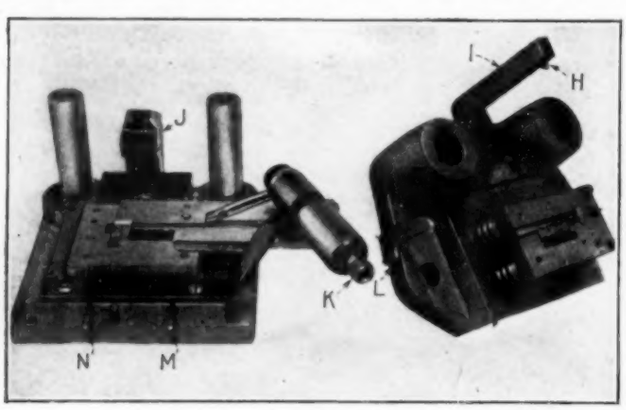
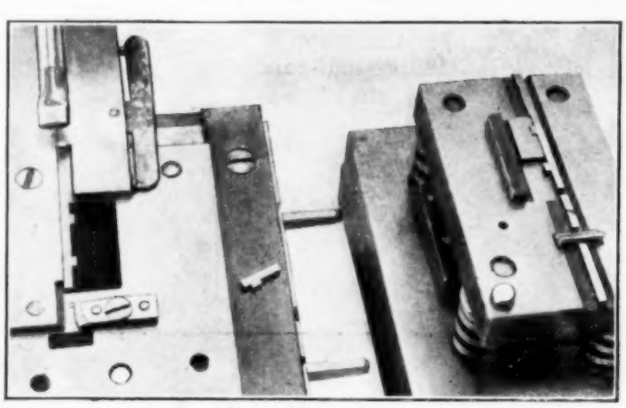


FIG. 6. FACE VIEW OF THE DIES

In operation, the die is first set for trimming the cams to specified length by bringing the vertical zero line *0* on the wing under locator *B*) to within $\frac{1}{32}$ in. of the required graduation on scale *C*. This offset is enough to allow the dies to trim the cams longer than finish size by about 0.010 in. which amount is left for shaving in a second operation in the same dies. For the shaving cut, which is taken after the entire lot has been trimmed as above, the locating device *B* is reset to the requisite graduation and the work run through as before the removing of the thin chip which smooths the cam ends perfectly and brings them to an exact length.

There is another type of die that should be of interest in this article—the progressive trimming and shaving





FIGS. 10 AND 11. PROGRESSIVE TRIMMING AND SHAVING DIES

arrangement illustrated by Figs. 10 to 12. These tools are for the manufacture of a small key of the dimensions given on the part detail in the last illustration. The material used is steel lengths about $\frac{1}{8}$ in. wide by 0.078 in. thick. The dies perform their work by cutting away the material from one side only, thus producing the piece complete by the trimming and shaving process.

The key is finished 0.458 in. long and has a projection at one side 0.015 in. high by 0.090 in. wide. The method of running the stock through the dies will be understood upon examination of the plan views of the tools in Figs. 11 and 12.

The material is fed in through the narrow channel guide at the right of the die openings and with the first stroke of the press the trimming punch *A* takes a cut along the edge indicated at

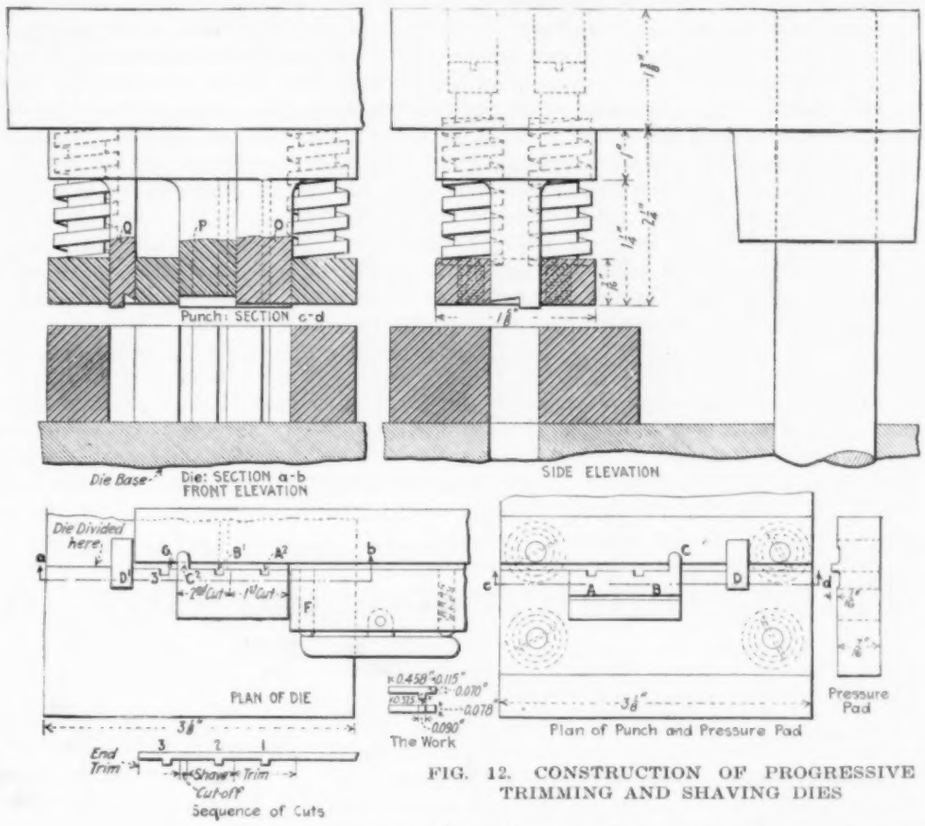
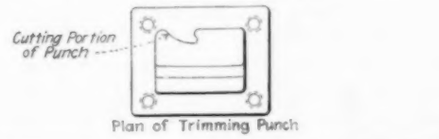
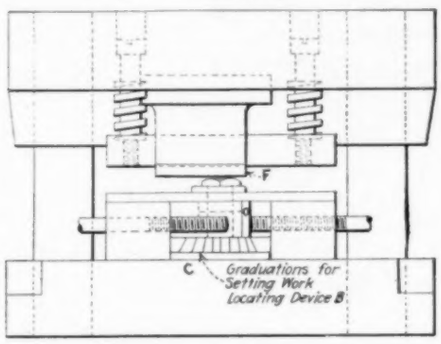
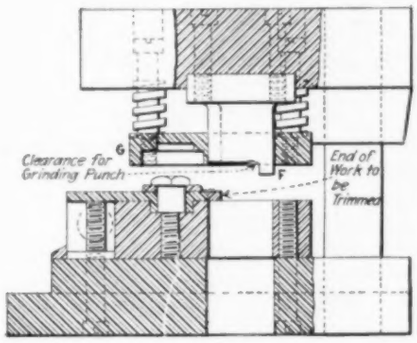
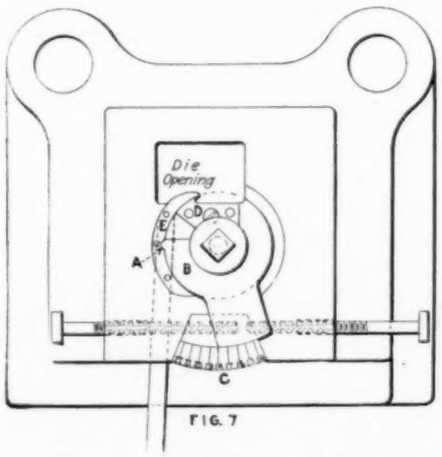


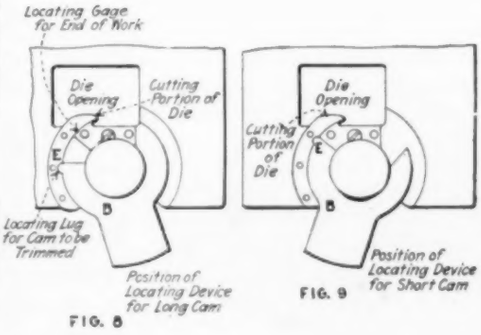
FIG. 12. CONSTRUCTION OF PROGRESSIVE TRIMMING AND SHAVING DIES










Locating Gage for End of Work
Die Opening
Cutting Portion of Die
Locating Lug for Cam to be Trimmed
Position of Locating Device for Long Cam
FIG. 8
Die Opening
Cutting Portion of Die
Position of Locating Device for Short Cam
FIG. 9

FIGS. 7 TO 9. DETAILS OF TRIMMING AND SHAVING DIES

Fig. 7—Construction of the dies. Fig. 8—Adjustment for the longest cam. Fig. 9—Adjustment for the shortest cam.

A^2. At the next advance of the stock, the portion already trimmed is shaved as at edge B^1 by the punch B, and the trimming punch A operates on the next cut. At the same stroke, the extension C on the shaving punch B cuts off the key at the point d and when the work is advanced to the third position the end of the key is trimmed by the punch D and die D^1. Each succeeding stroke of the press then causes one portion of the stock to be trimmed closely to the key width, the preceding portion to be shaved to size and cut off, and the leading end of that piece to be shaved to length.

Fig. 12 shows the principal features of the tools but certain details are best seen in Figs. 10 and 11, particularly the air nozzle and control for blowing the finished blank from the dies. The narrow strip of stock is pressed back to the guide by the spring-actuated finger *F* at the front, this being shown by dotted lines in the plan view of the die in Fig. 12. At *G* is a small knockout pin which is operated by a wedge-shaped member underneath to lift the finished work slightly and so allow the compressed-air charge to blow the piece clear of the dies. The wedge for

operating this is itself moved forward against spring pressure by a pivoted latch *H*, Fig. 10, which is carried on a vertical arm *I* adapted to operate in tube *J* at the rear of the die. The pivoted piece *H* on the down stroke rocks up sufficiently to swing past the end of the wedge and on the ascent of the punch it drops back to its seat and acts against the end of the wedge which then slides forward and operates the knock-out pin *G*, Fig. 12.

The air nozzle is controlled by the plunger *K*, Fig. 10, and the hooked finger *L* on the punch head which acts upon the plunger head when the punch rises with the press slide. The stop for the first position of the stock is operated by lever *M*, and the second stop by lever *N*.

The Form of the Punches

The different views, however, show the form of the punches and stripper, as well as the die itself which is made in halves to facilitate construction. The trimming and shaving punches *O* and *P*, Fig. 12, are of different height of cut so that the trimming tool does its work before the shaving die strikes the stock. Both punches, and the end punch *Q* as well, are made with back portions extended downward sufficiently to enter the guides formed by the die openings before the cutting portion contacts with the work. The cutting edges are cleared as shown and the relief along the center of each punch end enables the tool to be ground readily.

Another set of dies of this same construction is used for trimming and shaving a longer key and here the punches are sheared from end to end to enable them to take the longer cut easily and with smoothest possible result. The shearing angle on the cutting edges is about 3 deg.

The pressure pad and stripper for the punches shown is backed up by very heavy springs at the four corners and the pad face is milled away as shown to leave a narrow bearing surface along the face for contacting with the work. This holds the narrow stock strip securely against possibility of rocking during the taking of the cuts along the one edge.

Patent Interferences and How to Meet Them

By E. H. MICHAELIS.
Consulting Mechanical Engineer

Many dollars and much time have been wasted on inventions which were conceived almost simultaneously by several people. Of course, this cannot be helped, but certain precautions can be observed which will assure the inventor that he cannot be robbed of his patent if he really was first in the field. Some good advice along this line appears in this article.

FREQUENTLY, patent attorneys and others whose business brings them into contact with inventors hear the complaint "somebody must have stolen my idea, because there is another application for letters patent pending in the Patent Office and an interference is declared. I am sure that I am the first and only inventor."

The men speaking thus forget that there are one-hundred million people living in this great country of ours and that it happens frequently that two or even three individuals living far apart are working along the same lines and come to the same conclusions. The consequence is that there will be made two or three applications for letters patent on the same invention.

Rule 93 of the Rules of Practice in the U. S. Patent Office defined interference as follows: "An interference is a proceeding instituted for the purpose of determining the question of priority of invention between two or more parties claiming substantially the same patentable invention."

It is easy to see that it is impossible to prevent the occurrence of interference proceedings because every one of the inventors making a bona fide application believes himself to be the first and sole inventor. The U. S. Government will issue a patent to and protect the man who proves that he really is the first one who has invented a useful article, but it is not enough that the inventor makes a statement as to when he first started to develop his idea; he has to bring proof for his statement.

But let us for the sake of better understanding follow the proceedings of an interference case. Two men who have never heard of each other, one living in Bangor, Me., the other in San Francisco, Calif., make application for letters patent on the same invention. Suppose that Mr. Bangor files his application first. When the examiner finds that an interference is necessary he will notify both parties that probably an interference will be declared, and he will ask for an informal statement regarding the date when each first conceived the idea of the invention. In all following proceedings Mr. Bangor will be the senior party and Mr. Frisco the junior party, according to the time of filing their applications. The informal statements will not be kept on the files but will be returned to the senders.

After examining both statements the primary examiner will follow Rule 96 of the Rules of Practice: "Whenever the claims of two or more applications differ in phraseology, but relate to substantially the same patentable subject matter, the examiner, when one of the applications is ready for allowance, shall suggest to the parties such claims as are necessary to cover the common invention in substantially the same language. The examiner shall send copies of the letter suggesting claims to the applicants and to the assignees as well as to the attorney of record in each case. The parties to whom the claims are suggested will be requested to make those claims and put the applications in condition for allowance within a specified time in order that an interference may be declared. Upon the failure of any applicant to make the claims suggested within the specified time, such failure or refusal shall be taken without further action as a disclaimer of the invention covered by the claims, and the issue of the patent to the applicant whose application is in condition for allowance will not be delayed, unless the time for making the claim and putting the application in condition for allowance be extended upon a proper showing. If a party makes the claim without putting his application in condition for allowance, the declaration of interference will not be delayed, but after judgment of priority the application

of that party will be held for revision and restriction, subject to interference with other applications."

Mr. Frisco and Mr. Bangor adopt the suggested claims through their attorneys and put their applications in condition for allowance. Thereupon the examiner of interferences takes jurisdiction of the case, which now is called a "contested case." The contestants are notified to prepare and file a preliminary statement, under oath, showing the following facts:

1. The date of the first conception of the idea.
2. The date upon which the first drawing of the invention and the date upon which the first written description of the invention were made.
3. The date upon which the invention was first disclosed to others.
4. The date upon which the invention was first reduced to practice.
5. A statement to what extent the invention has been put to use.
6. The date and number of any applications for the same invention filed within 12 months, before the filing date in the United States, in any foreign country adhering to the International Convention for the Protection of Industrial Property or having similar treaty relations with the United States.

If a drawing or written description of the invention has not been made or if the invention has not been reduced to practice or disclosed to others, the statement must show these facts.

These preliminary statements are very important and should be prepared very carefully, because the parties will be strictly held in their proof to the dates given therein. If a party proves an earlier date than mentioned in the preliminary statement, such proof will be held to establish the given date and none other.

Our two friends filed their statements with the examiner of interferences according to rules in sealed envelopes, containing nothing but the statements and marked as follows: Name of the party filing it, title of the case and the subject of the invention.

After both had filed these statements, they were opened by the examiner in charge and then the attorneys of the applicants looked into the matter. They examined the statements made by their opponents. It was found that Mr. Bangor, the senior party, had not reduced his invention to practice nor had he disclosed it to others, but he claimed in his statement that he had conceived the idea at a date 11 months prior to the filing of his application, while Mr. Frisco claimed to have made the first sketch of his invention 13 months before the filing date, that he had made and used his newly invented appliances in his own shop and that he had sold some of them to other firms. Both attorneys called for substantiating evidence. So Mr. Bangor went with his lawyer to a notary public in his home town and Mr. Frisco did the same.

Mr. Bangor could not prove his statements, because like very many inventors he was afraid to show anybody his invention or even talk about it before he had it patented, and so the earliest date he could prove was the date upon which he employed his patent attorney to prepare his application.

Mr. Frisco had his sketch with him and could prove when it was made because he had it dated and attested by a notary public at the time he made it. He could prove when he started to make his first apparatus, because he had the receipt of a patternmaker and the check with which he paid the man who made the patterns for this first apparatus, and for later dates he had orders and affidavits of other firms proving that they were using his invention.

The attorney of Mr. Bangor told his client the best thing to do was to concede priority to Mr. Frisco, because in order to fight the case further it would be necessary for them to go to San Francisco and cross-examine the witnesses, and as the case looked very bad for Mr. Bangor, he would advise him not to spend his money foolishly. But Mr. Bangor thought differently. He was well to do and did not care if it did cost money, as long as he could beat the other fellow. So to San Francisco they went and before a notary public a cross-examination of Mr. Frisco and his witnesses was held, which proved conclusively that Mr. Frisco, in spite of being the junior party, was really the first inventor.

From the foregoing it will be clear that every inventor should heed the following advice:

1. Make a sketch showing the main features of your invention as soon as you conceive the idea, or if you can not make any sketch, write a description of your general idea and have this sketch or description dated and attested to by a notary public.
2. When you start to reduce your invention to practice (which means when you have drawings or a model made), get a statement from the man who does the work for you that you ordered from him a drawing or model on this certain date, and have this statement attested to by a notary public.
3. In case you make your own drawing, have it dated and attested to by a notary public.
4. If you intend to make your own model, have a part at least made by someone else; get a receipt from him and see that your payment is entered in his books with your name and article paid for mentioned.

If you follow the advice given above you will be well provided in case your invention should be involved in an interference case.

Bad Features of Drilling-Machine Tables

By Fred D. Hood

Why is it that so many drilling-machine tables are made on the underside like bad roads—a succession of hollows and humps?

Some are made like *A*, Fig. 1, with T-slots and a few innocent slots in between leaving the highway underneath like a road after the gas company has finished with it. Others, again, fearing perhaps that the open slots will accommodate too large a variety of bolt heads, have a ridge along one side, presumably to keep the bolts

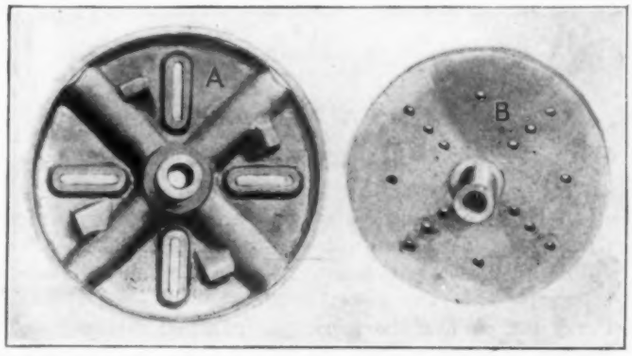


FIG. 1. TYPES OF DRILLING-MACHINE TABLES

from turning, but actually keeping most bolts from earning a living. Using bolts under these circumstances is bad enough, but when it comes to getting a footing for a faithful friend like a screw clamp, it needs a chart to avoid the rocks. And if all the other obstacles were removed, the rib around the outer edge of the table would block the channel.

The circular table is not the only offender in this category. Note the inverted settling basin under the square one, shown in Fig. 2; also the clamp repeller around the edge.

Unfortunately for my point I am unable to get within reach of some samples of this type that I have

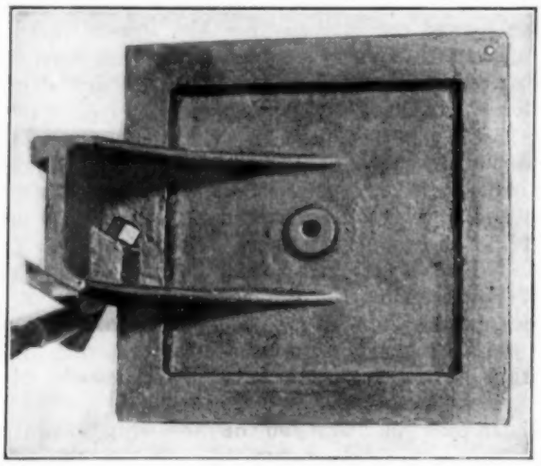


FIG. 2. ANOTHER KIND OF TABLE

come across, but those shown will probably call to the minds of readers other bright specimens f a similar kind.

In Fig. 1 at *B* is a new kind of table which is replacing the sculptured one. It is perfectly plain on its upper and lower sides, has a bored hole through the center and four radial rows of four holes each for bolting down work. This appears to answer all purposes. Cored slots would do equally well, but in this case beginners frequently run a drill halfway into the slot and the table, usually breaking the drill. The new table is thick enough to be equally as stiff as the other kind and allows for occasionally truing up—a luxury seldom enjoyed by this class of machinery.

The solid type of table is about 1¼ in. thick and weighs the same as the cored type, about 85 lb. for an 18-in. table. It is also more convenient for the use of clamps.

Outside of the features noted above, it should in justice be said that the machines from which the illustrations were taken are excellent ones, having given uninterrupted service for years.

In Retrospect

By W. D. Forbes

In continuing the line of thought that was started some months ago in the *American Machinist* under the above title, concerning the origin of things mechanical, I have a word to say on the subject of chucks.

The first lathe chuck I ever saw was made by Judson. It was in the year 1874, in the shops of the Hoboken Ferry Co. When the work was grasped in the jaws, a system of wedges drew the latter down to the body of the chuck, but how this was done I cannot clearly remember. Perhaps some of the readers of this journal may be able to explain it.

I have not been able to find out where this chuck was made but the Hon. L. D. Whiton, of New London, Conn., told me that he thought it was made in Rochester, N. Y., or in some city in the center of that State. Here again readers may supply information. The chuck referred to was a four-jawed independent.

Mr. Whiton also gave me these facts concerning the history of lathe chucks. The first chuck was made in Stafford, Tolland Co., Conn., in 1843 by a man named Fairman. It was of the scroll type with four jaws; consequently, it was what we now call "universal."

The first combination chuck that I can remember was made by the National Chuck Co. A ring was placed back of the circular rack on which were cams. In the body of the chuck, bosses were cast so that when the ring was turned the cams on it met the bosses and put the rack in mesh with the pinions on the jaw screws. A stem was made fast to the ring, this stem passing through a slot in the rim and having a thumb-nut on it to secure it against shifting. Later, another chuck of this class had the same system of cams on the ring but employed three or four movable cams (according to the number of jaws) to throw the rack into mesh.

Universal chucks in which circular racks were used I had heard about before I saw the Judson, but I had not seen one. What is known as the "box" chuck was made, according to Mr. Whiton, for use on brass finishing lathes, but where or when he could not say. I should think those who first made the Fox lathe could shed some light on this matter.

In the early eighties I bought from the Whiton Co. a small chuck of the scroll type, called the "amateur's chuck," and the front half was furnished with a circular rack. This rack was moved by means of a pinion key which was removed after closing or opening the jaws, just as any wrench would be. Later, this system was used in small drill chucks and, if I remember rightly, a long legal battle was fought over the design.

In the early drill chucks very little attention was given to balance but with the higher speeds now used for drilling, balance is of prime importance and the workmanship on some of these chucks is about perfect. I once gave a friend in France one of these drill chucks, and, after looking at it, he said, "this is more perfectly made than any watch I ever saw."

In a previous article I referred to the origin of the blueprint process. A friend writes me that I could have gone further back if I had consulted a certain work which placed the first suggestion of this valuable process about 1790. I have not been able to consult the work but I am told that the original idea of the system dates back to the Middle Age. Lace makers and architects in those days laid their patterns on a piece of green cloth, covered it with a glass, and let the sun shine on it for several days; when the pattern was removed its form was found in darker color, as the exposed part of the cloth had faded, leaving the darker pattern.

My informant told me that in a book belonging to the late W. F. Durfee of Bridgeport, Conn., published in Italian about 1770, a description of this sun printing process was given. I think Mr. Durfee gave his books to the American Society of Mechanical Engineers, and the book referred to was named "The Magic of Nature."

Tool Storage in a Gas-Engine Factory

EDITORIAL CORRESPONDENCE

The tool-storage room where the attendant goes pawing over the shelves to find the desired tool is a dead issue in the best of our modern shops. This article describes the storage system of a large gas-engine plant which is building a wide range of engines, and, consequently, has many tools and fixtures to care for.

SEVERAL articles in the past have told the readers of the *American Machinist* something of the methods used by the Fuller & Johnson Manufacturing Co., Madison, Wis., in the production of its small power gas engines and engine-driven lighting unit sets. The quality of the machining methods throughout the shops is reflected in the corresponding degree of care used in the tool department of the shop for the storage of the many cutters, jigs and fixtures that are used to insure interchangeability.

The toolroom has been handled on the theory that there shall be a place for everything and each piece in its appointed place; certainly, this is well exemplified by such a milling-cutter storage board as that shown in Fig. 1. This board has been fitted with suitable rows of wooden pegs upon which each separate size of cutter may be hung as it is returned from the shop. Below each peg is a small aluminum plate which carries the size designation of the part hanging above. In some cases an additional plate carries further information for the guidance of the tool-crib tender, such as "plain," "two pair" or "special." One end of the plate is fastened by a tack; the other is held by a hook-eye upon which the attendant may hang the tool check of the workman who draws out the tool.

The only tools left in the shop after a job is finished are heavy special fixtures which are so difficult to move that it is considered impractical to have them in the regular tool-storage rooms. Even many of the regular lathe dogs are hung on the storage racks, Fig. 2, so that the workman knows just where he can obtain them instead of trying to borrow a dog from an adjacent machine. In this section of the tool crib will also be seen a number of the different types of gages.

The writer has visited a number of machine-tool-building shops that make it a practice to make up a complete new set of tools and fixtures for each machine part to be made, even though this may involve numbers of duplications of standard cutters and reamers that may be used on similar parts. The idea of this is that there shall always be a full set of useable tools for each part in process, so that the production of one piece will not delay the production of another piece which may be desired at the same time, nor will the damage or

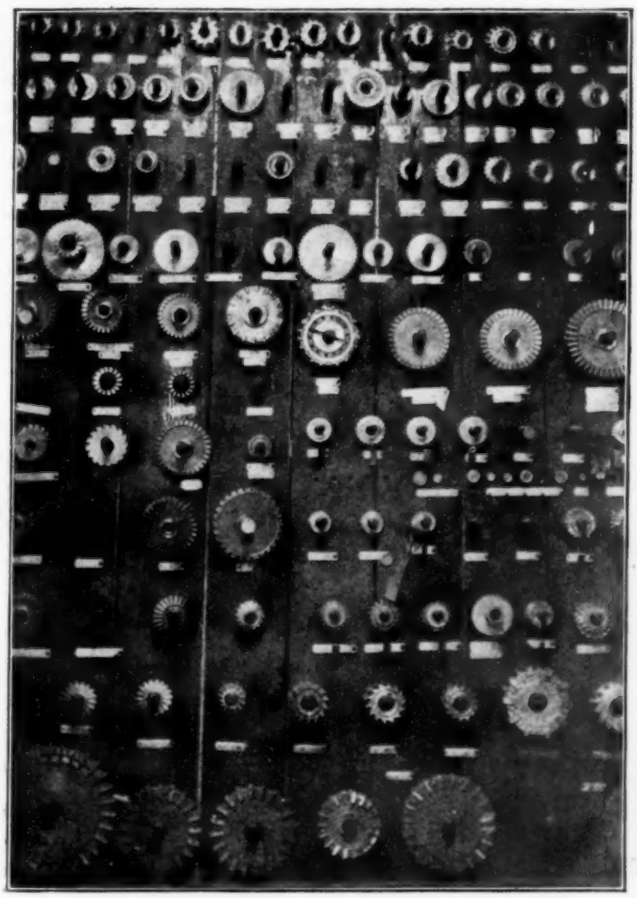


FIG. 1. TYPE OF STORAGE BOARDS PROVIDED FOR MILLING CUTTERS

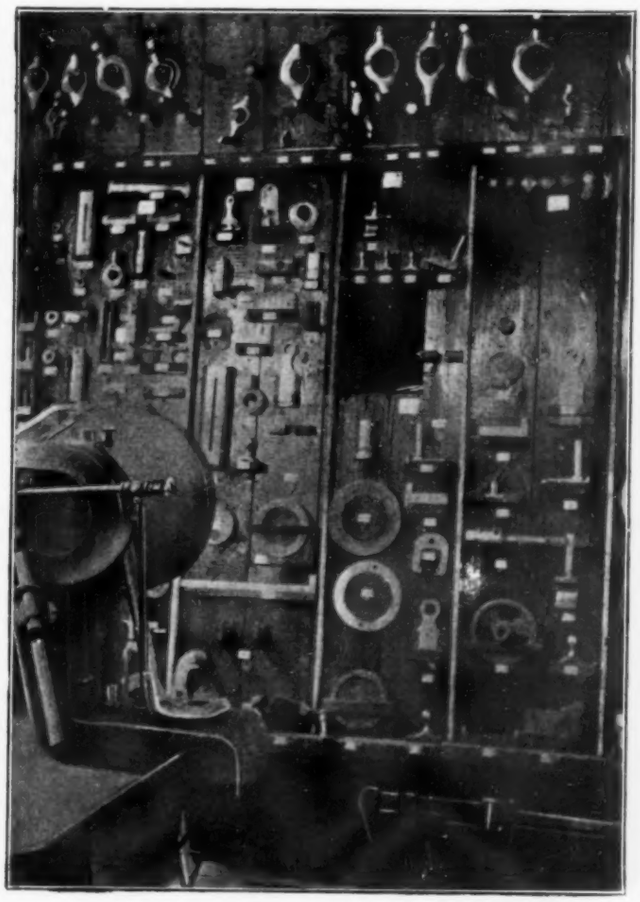


FIG. 2. STORAGE FOR LATHE TOOLS AND GAGES

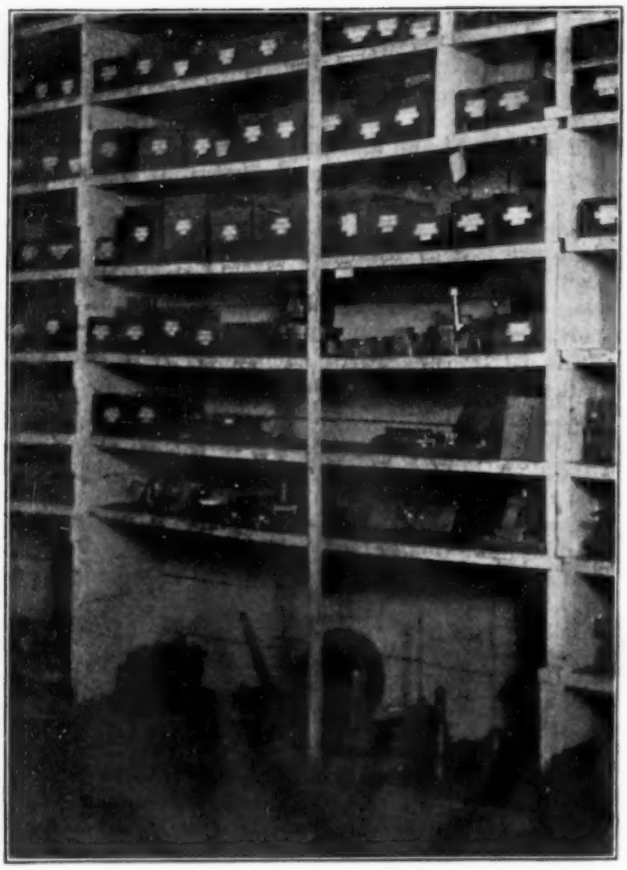


FIG. 3. TOOLS FOR SPECIAL PARTS GROUPED IN CONTAINERS

breakage of any one tool delay the product on more than one piece. Such groups of tools are then assembled in separate containers ready to be drawn out from storage by the workman when he commences an operation on that particular part.

To a certain extent this same practice is followed at the Fuller & Johnson plant where special tools and fixtures for a part are assembled in group containers which bear the part designations to correspond with the parts of the different engines. Such group containers may be seen arranged on the tool-storage shelves shown in Fig. 3, and here again each one bears a numbered aluminum plate which corresponds with the designation of a particular part of an engine. Larger fixtures that are too bulky to box are laid in corresponding order on the lower shelves of this same tier.

In numbering the engine parts, a system has been followed in this shop which makes it much easier to identify the parts for which different tools are to be used. This was accomplished by numbering all the same parts on different engines with the same number and then adding a prefix letter with a dash before each to indicate the engine size. Thus, the camshaft might be part "22N," and when written with the engine size might appear as part "J—22N." This system cuts the memory work down to remembering the part designations for one complete engine, and the few necessary letters to identify the different sizes of engine types. This numbering system is utilized in the tool crib by placing in proximity to one another all group containers intended for the same operation on similar parts. Thus, all the containers for perhaps the second operation on the connecting-rods for the different sizes of engines would be grouped together on one shelf, or more; while the tools for the following operations on the same parts would be found in the proper sequence on the adjoining shelves.

Special fixtures are drawn from the tool crib by the workman on his tool checks just as are his other tools so that the responsibility for lost or broken parts may always be fixed. Everything that comes back to the tool crib goes to certain shelves reserved for incoming tools and remains there until the foreman of the tool department has an opportunity to inspect it. Should any fault be found, the tool is taken immediately to the toolroom and put in perfect condition before it is returned to its proper storage place in the crib.

The Foreman Not Held Responsible for the Care of Numberless Blueprints

In this plant the busy foreman is not held responsible for the care of the numberless blueprints; these likewise are kept in the tool crib, under a similar system of checking and supervision. The drawings have been entirely standardized with each individual part shown in a separate sketch. The blueprints are mounted on a heavy manila or fiber paper and given a thin coat of varnish or shellac to prevent them from absorbing oil and dirt when being handled. When delivered to the tool crib they are placed in numerical order in the vertical filing bins seen in the foreground of the illustration, Fig. 4. The swinging panels above are covered on both sides with rows of hooks, each one of which carries a small tag bearing a number and designation to correspond with the blueprints filed in the bin below. When a workman requires a blueprint he draws it in the same manner that he would a tool and leaves a check that is hung on the proper hook on the board above. Thus a record is always kept of where each blueprint may be found and should some one else have occasion to refer to the same blueprint, he can find out here which workman he should look for to find the desired print. Blueprints are always inspected when they are returned, and when they begin to shown signs of wear they are laid to one side until the drawing-room boy, in the course of his daily inspection, can make a note of the numbers of the prints needed and prepare them for delivery on his next round. Varnished prints which are merely dirty can usually be cleaned a number of times with a piece of clean waste and gasoline.

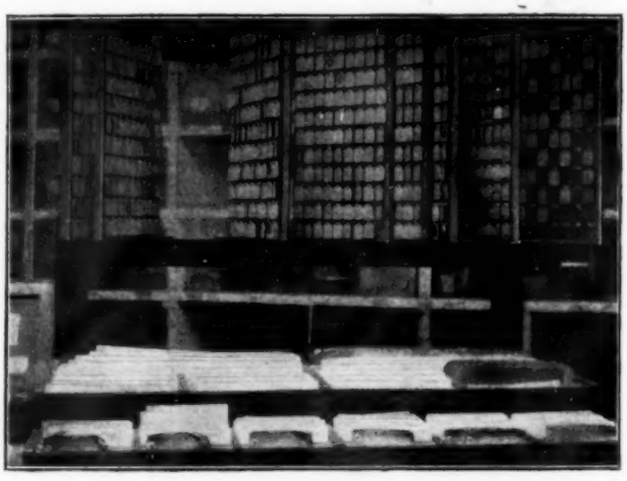
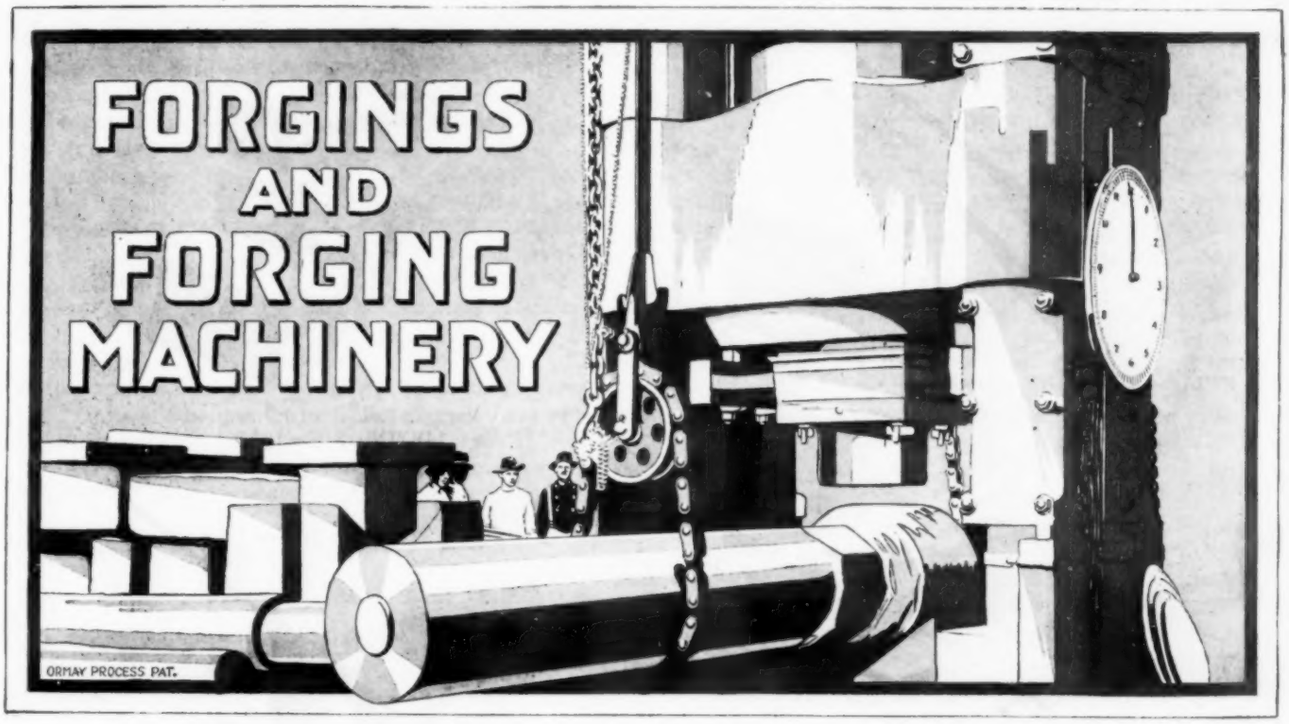


FIG. 4. STORAGE AND CHECKING SYSTEM FOR SHOP WORKING DRAWINGS



Forging Round and Shaped Pieces Under the Steam Hammer

By A. S. HESSE

It is as necessary to have dies and tools for successfully forging round shapes under the steam hammer as it is for the more irregular shapes. Likewise, it is necessary to have swages for forging rounds if these are to be worked commercially to close dimensions.

MANY hammersmiths work round forgings between the flat faces of the hammer, using light blows for finishing. This practice is very injurious to the material, as light blows with a flat die give a spreading, or bulging, effect, as indicated by the diagram *A*, Fig. 1. This bulging leaves the center of the bar with a different structure from the outside, and the latter alone is refined and well worked by the light blows. The weight of the blows struck by the hammer determines the depth, measuring from the outside to the center, of the refining influence upon the material.

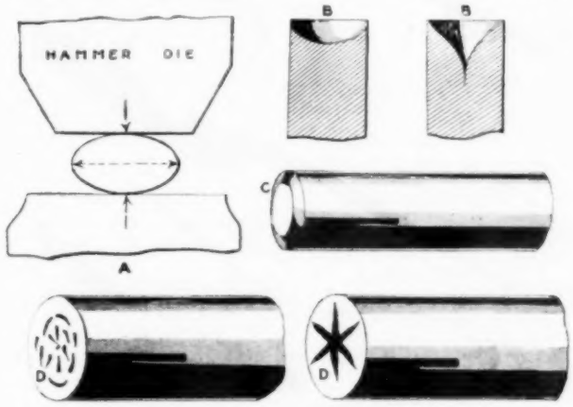


FIG. 1. EFFECT ON THE STOCK, OF DIFFERENT METHODS OF FORGING

A competent hammersmith will always know when the metal is being damaged in this way. It evidences itself by the ends of the forging becoming concave, "cupped" or "dished," as such an end is variously termed. It occurs because the outer layer of the steel has been flowed to a greater extent than the center, and is shown at *B*.

When the forging is properly worked (and this applies to either round or other shapes), the blows of a hammer which are of sufficient weight to penetrate through the forging will produce the opposite result. The center will protrude slightly at the end of the bar, as indicated at *C*, because the center is hotter and so flows more readily while at the same time its crystalline structure will be thoroughly refined.

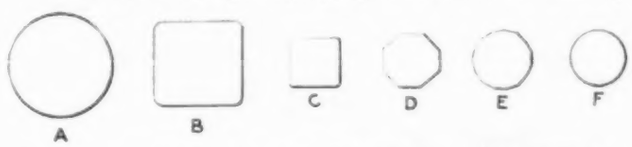


FIG. 2. SEQUENCE TO BE FOLLOWED IN REDUCING ROUND STOCK TO SMALLER DIAMETER

When the light forging blows which have caused the end to cup, are continued after the heat on the outside of the forging has fallen, cracks will develop in the center of the end of the forging, as shown at *D*, and these always start on the surface. If, with the

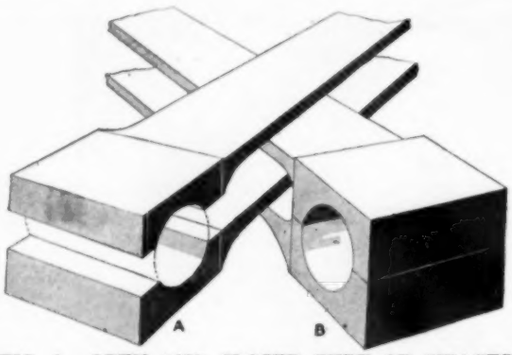


FIG. 3. OPEN AND CLOSED TYPE OF SWAGES

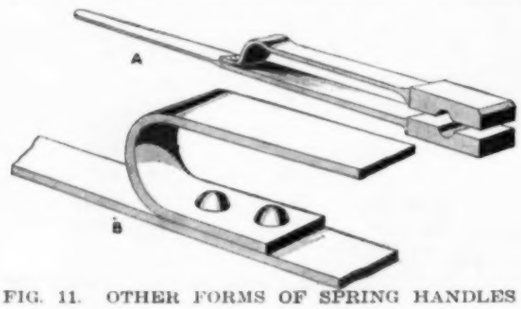


FIG. 11. OTHER FORMS OF SPRING HANDLES

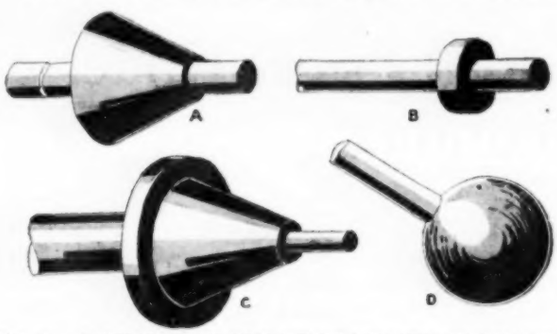
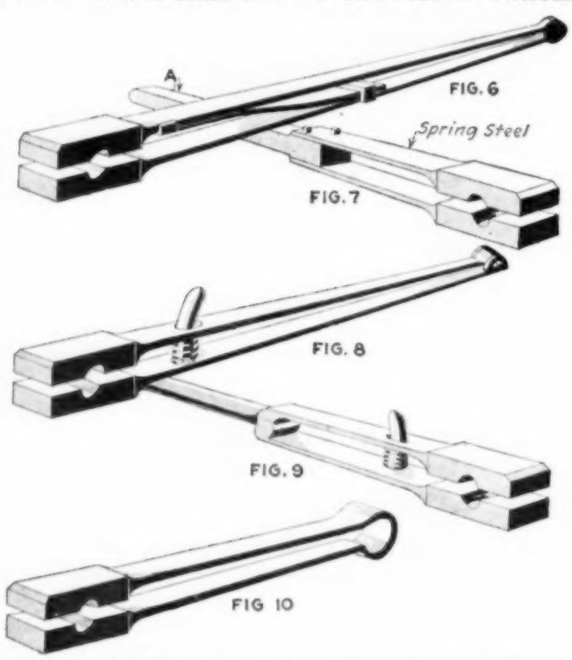


FIG. 12. FORMS THAT CAN BE PRODUCED IN SWAGES



FIGS. 6 TO 10. DIFFERENT FORMS OF SWAGES

Fig. 6—Hinged swage with flat spring. Fig. 7—Spring swage with wooden handle. Fig. 8—Hinged swage with guide pin and spring. Fig. 9—Hinged swage with long handle. Fig. 10—One-piece spring swage.

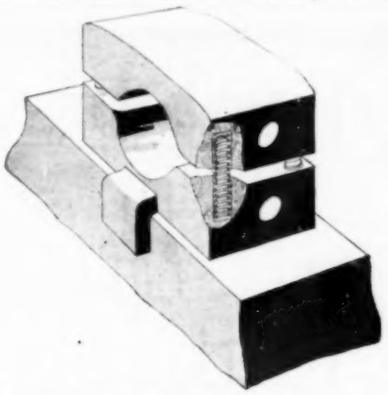


FIG. 5. SWAGE WITH COIL SPRINGS FOR LIFTING TOP HALF

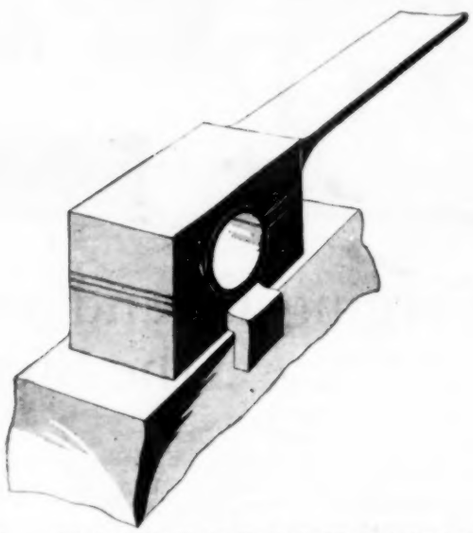


FIG. 4. EARLY FORM OF SWAGE WITH LUGS FOR HOLDING ON HAMMER DIE

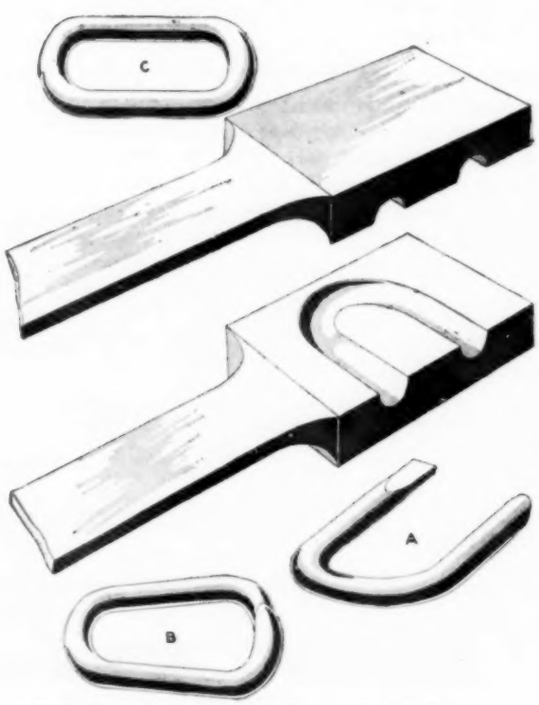


FIG. 13. LINK WELDING WITH A SWAGE

forging at low heat, the working is continued the cracks will finally extend its whole length. Light blows on the forging do not tend to draw the material lengthwise, but only to work it in the shortest direction, which is sidewise; they therefore exert only a crushing effect on the structure of the steel.

When a piece has been worked until the heat has become too low it is not good practice to attempt to finish the outer surface by using very light blows of the hammer. When a great deal of finishing is required it is better to reheat and work the forging the long way of the die. When no swages are available for finishing, this method of working lengthwise of the die may help to save the forging.

Some hammersmiths offer a variety of excuses when these flaws or defects develop in a forging, a frequent claim being made that there was a flaw or crack in the billet or stock from which the forging was made. In the majority of cases, however, the trouble is entirely

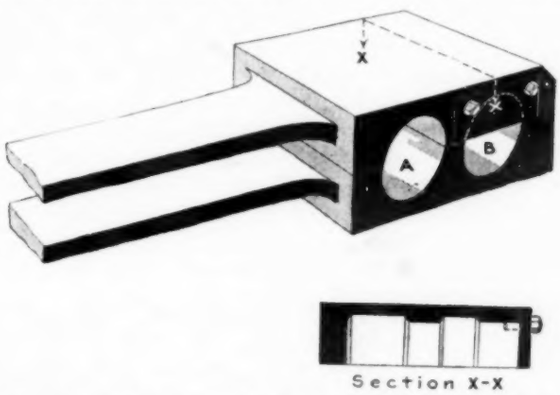


FIG. 14. SWAGE WITH PERMANENTLY ATTACHED TRIMMING TOOL

due to the smith's incorrect manner of working it. A mistake of many hammersmiths when drawing a forging to a smaller size is to advance the work nearly the full width of the die for each blow. The hammer should strike new material on each blow equal to only one-third or one-half the width of the die. A drawing operation performed in this way requires only from one-half to two-thirds of the time that would be required by the wrong method, and the material of the finished forging will be improved rather than injured by the operation.

A mistake less frequently made is that of working a round piece to a smaller size, and at the same time keeping it round throughout the operation. No other method is so injurious to a piece of iron or steel as this, as it quickly opens up seams and faults throughout the entire forging. The proper way to draw down a forging that is afterward to be shaped round is shown in the sequence *A* to *F*, Fig. 2. This shows a start made from a round forging, which is first squared, then drawn down to a smaller size, and finally worked through an octagon into the round required.

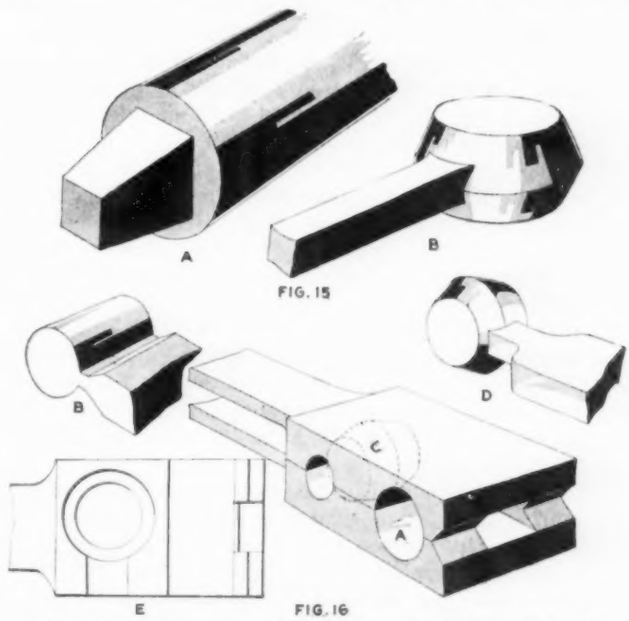
The use of proper swages will aid greatly in overcoming the faults of bad practice and careless workmanship. Hammersmiths express various views in regard to the best type of hammer swages and the shape of the different passes. Some prefer the open type, as at *A*, Fig. 3, while others prefer the closed type *B*. My opinion is that the latter type is the better, as it eliminates guesswork and avoids frequent stops to caliper the forging. When the closed type of swage with dies of the correct size is used the smith knows that the forging is to size when the swages come together.

A common mistake of blacksmiths is to think that one size of swage will do for three or four sizes of round forgings. The use of over or undersized swages adds to the other faults of hammer-forging methods and does not lend itself either to rapid production or to uniform and accurate sizes.

A shop should have a full set of swages, and for general service these should range from ½ in. in diameter to 3 in. in diameter, increasing by eighths of an inch. Above 3 in. in diameter the increase may be by ¼-in. steps, according to the general character of the work being done. The swages should be graduated in strength for the different sizes of hammers in the shop. In other words, swages for use on a 2000 or 3000 lb. hammer must be built much sturdier than those for a 500 or 800 lb. hammer.

An open swage is permissible for forging round tapers. To use a closed swage for this purpose would necessitate having the swage either wide enough to inclose the whole length of the taper or else separate swages for the various sections of the taper. However, the use of open swages for this kind of work depends somewhat upon the length of the latter, but all work requiring the use of an open-type taper swage requires considerable skill. I have seen some very nice tapered work done on large pieces by using a tapered V-block under the hammer.

In the past many shops making heavy forgings did not use swages for this work, as they considered it cheaper to forge it roughly to size between flat dies and turn-off the surplus stock in the lathe, wasting this excess stock rather than to bother with the heavy



FIGS. 15 AND 16. REDUCING AND FORMING SWAGES

Fig. 15—Drawing a square extension from a bar or forging. Fig. 16—Swage for forging a ball

swages or forging dies required. The high prices of good grades of forging steel under war conditions have rather modified this situation, and the surplus weight of stock which can be saved by forging between round dies and swages, will pay for the extra cost of the additional labor necessary.

Thirty-five or forty years ago the swages used for heavy work were made from blocks of iron overlaid with shear or "blister" steel, as it was then called. The lower block was provided with lugs to hold it on the hammer die; the upper one had a handle to hold it on the work. This type is illustrated in Fig. 4. There were also spring swages, shown in Fig. 5, which were heavy, clumsy affairs, made of wrought iron faced with steel and having four coil springs set in recesses in the

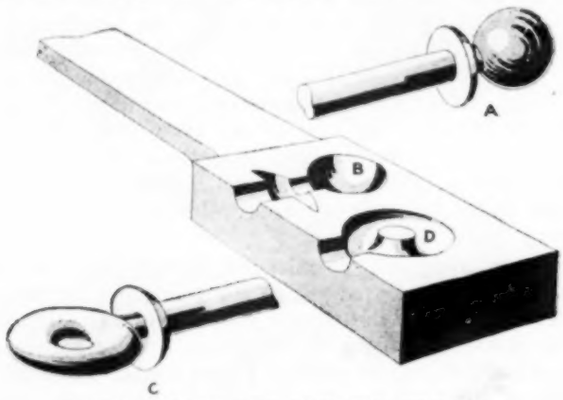


FIG. 17. SWAGE FOR FORMING EYE-BOLT

corners to spring them apart after each blow of the hammer. They had pin holes in the bottom block for the insertion of bars, which were used to lift them into and out of the hammer. They required two helpers to keep them from jumping out when a blow was struck.

THE HINGED-SPRING SWAGE

A later development is the hinged-spring swage, which is made of wrought iron, with the working surfaces faced with steel, welded to the wrought iron. These swages shown in Fig. 6. are made in one piece with the handle, and there is a hinged joint at the outer end. A flat spring is riveted to the handle of the lower half of the swage to hold it open.

The swage shown in Fig. 7 has a piece of spring steel welded to each member and these springs are bolted to a wooden handle as shown at *A*. Some of these swages may still be found in the older shops.

The spring swage shown in Fig. 8 has a long pin in the lower handle which passing through a slot in the upper handle guides the upper half. A heavy coiled spring surrounding the pin holds the swage open.

Another similar type with an extension handle is shown in Fig. 9. The guide pin should be located not over one-third of the distance from the center of the head to the hinges.

The swage shown in Fig. 10, and known as the one-piece spring swage, is made of the same material throughout. This is the easiest swage to make and when made right it gives good satisfaction, but the reins will lose their set if the swage is used on too heavy stock. The reins should taper from the head to the roll then widen slightly, and the bottom member should be the heavier of the two.

Some hammersmiths think that the two styles *A* and *B* of swage handles shown in Fig. 11 are the best.

These are the easiest to make of the two-piece swages, and are also a little easier to hold on the hammer die, and they are easier to dress when worn. Swages are serviceable in handling shapes entailing duplication of forgings. Forms such as shown at *A*, *B*, *C* and *D*, Fig. 12, can be readily made in swages, giving satisfactory results for a limited output.

The link-welding swage, Fig. 13, is an application of this type of tool, and its use here is as follows: The link is first bent and scarfed as at *A;* then the two ends are bent together as at *B*, leaving the link wider than the impression in the welding swage, which is made the size of the finished link. The previous spreading of the link results in the ends being closed together when struck by the hammer on the scarf, and assures a full-sized weld.

Cutting-off tools are occasionally applied to the swage to insure duplicate forgings of definite length. Such a swage, Fig. 14, is sometimes made with two passes, the forging first being done in the pass *A* and then transferred to the pass *B*, where a cutting-off chisel on the upper half is driven through the stock which is turned in the pass after each blow to cut it off to a specified length leaving a nice smooth end. The section *D* through the upper half of the swage at this point shows the manner in which the chisel is let into the block to prevent the bolts from shearing off.

Swages are used for square or tapered ends on bars like that shown at *A* in Fig. 15. A boss, as shown at *B* in the same illustration, is made by flattening a ball forged on the end of a rod and then shaping it in a swage.

A TWO-PASS SWAGE

A two-pass swage for forming a boss from a full-sized bar is shown in Fig. 16. The work is started in pass *A*, which necks down the bar and gives it partial form, as shown at *B*. The neck can then be drawn down a little further under the hammer dies without a swage. It is then worked in the pass *C* to the form shown at *D*. The plan view of the lower half of this swage is shown at *E*.

Such parts as the eyebolt shown in Fig. 17, usually made in a forging machine, may be made in swages under the steam hammer. The first operation *A* is performed in pass *B*, and the eyebolt *C* is completed in *D*.

Where a large variety of shapes is swaged the type

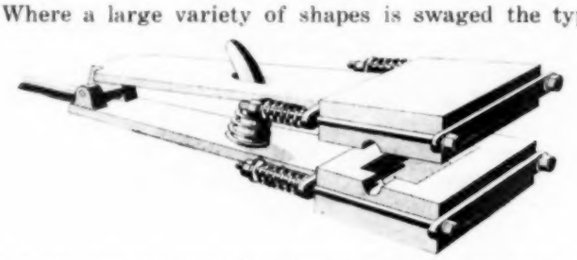


FIG. 18. SWAGE WITH RENEWABLE WORKING FACES

of swage reins with replaceable heads shown in Fig. 18 may be used to advantage.

The placing of coiled springs under the clamping bolts prevents the breaking of the bolts. Even with springs few bolts will stand the strain for any length of time but bolts of Swedish iron will last longer than any other material I have used for the purpose. The use of such a swage form with replaceable heads is of no service in shops that have a helve hammer, but for many shops that are equipped only with the standard types of steam hammers some of these forms of swages will undoubtedly be of value as an aid in the production of the work.

Plastic Arc-Welding on Ship Work

By J. O. SMITH

The engines of interned German ships, damaged by their crews, were successfully repaired by plastic arc-welding. This method of welding had been in use on a large Eastern railroad for some time previous to the entry of the United States into the World War and the results achieved in welding heavy cast-iron locomotive and other parts led the engineers of the Navy Department to try it as a means for repairing the damaged engines of the German ships.

THE repairing of the damaged engines of interned German ships by arc-welding brought into practical use a branch of the electrical industry that had not up to that time been employed on so extensive a scale or with the same incentive. The successful repair of the large cast-iron cylinders and other parts of the German ships by the Williams' plastic arc-welding method led naturally to consideration of arc welding in the manufacture and repair of metal products and parts of all kinds. The attention of engineers generally has been attracted by its possibilities, and the great achievement of successfully repairing the damaged engines has naturally given the subject great prestige among shipping and shipbuilding interests.

When the matter of welding in connection with ship-construction is considered, immense possibilities immediately suggest themselves. It has been definitely determined by exhaustive technical study and experiment that welding can be satisfactorily employed in ship construction, that ship plates joined by welding will be as strong or stronger than the oriignal metal at the welded joint, and that welding can be employed for ship-construction work at a saving of 25 per cent. in time and 10 per cent. in material, as compared to riveting.

In actual figures, as determined by experiments of the Emergency Fleet Corporation's electric welding committee, it was determined that, by welding, in the case of a 9500-ton ship the saving in rivets and overlapped plates would amount in weight to 500 tons, making it possible for the ship to carry 500 tons more cargo on each trip than would be possible if the ship plates, etc., had been riveted, instead of welded.

An investigation by the same committee has definitely established the following points: That electric-welded ships can be built at least as strong as riveted ships; that plans for ships designed to be riveted can easily be modified so as to adapt them for extensive electric welding, and thus save considerably in cost and time for hull construction; that ships especially designed for electrc welding can be built at a saving of 25 per cent. over present methods and in less time.

An electrically welded ship is credited with many advantages over a riveted ship. In a 5000-ton ship, about 450,000 rivets are used. A 9500-deadweight-ton ship requires 600,000 or 700,000 rivets. By the welding process the saving in labor on the minor parts of a ship is reckoned at from 60 to 70 per cent. on the hull, plating and other vital parts; the saving in labor, cost and time of construction by welding is conservatively placed at 25 per cent.

That electric welding will some day largely replace riveting is also the judgment of the electric-welding committee which is composed of many leading experts in both the electrical and metallurgical branches of the welding field.

Considerable investigation of the subject of welding instead of riveting has been made in England by Lloyd's Register of Shipping, particularly with regard to formulating rules for application to the electrical welding of ships. As a result of the investigations and experiments made by the technical staff, it was determined that the matter had assumed such importance as to warrant the formulation of provisional rules for electrically welded vessels, and these have been issued, for the guidance of shipbuilders, by *Lloyd's Register*.

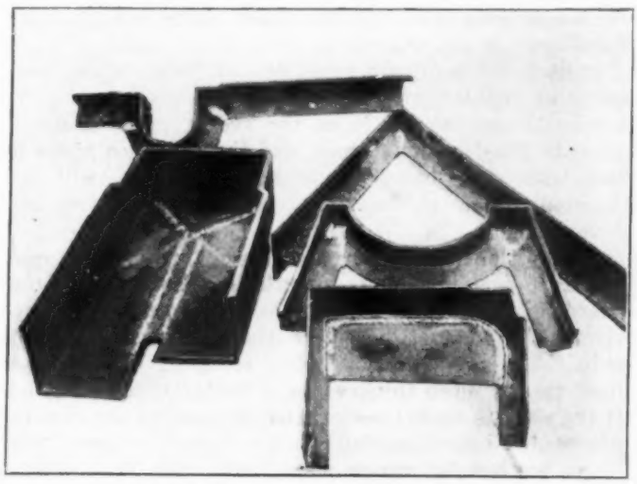


FIG. 1. WELDED PARTS FOR SHIPS

The experiments conducted in England followed three well-defined lines of investigation: Determination of ultimate strength of welded joints, together with their ductile properties; capability of welded joints to withstand alternating tensile and compressive stresses, such as are regularly experienced by ships; and a microscopic and metallurgical analysis to determine if a sound fusion was effected between the original and added metal.

It was determined that the tensile strength of the welded joints was from 90 to 95 per cent. of the original plates, as against a strength of from 65 to 70 per cent. in riveted joints, showing a margin of 25 per cent. increased strength in favor of the welded joints.

The result of the tests of the elastic properties of welded joints determined that there was a slight difference in favor of the riveted joint, but the art of welding has made such great strides recently that it is now believed entirely possible to make a welded joint in ship plates that will stand as great a number of reversals of stresses as a riveted joint.

Microscopic and metallurgical analyses have determined that a good, solid, mechanically sound weld was made between the original and the added metal, the two having been fused together so perfectly that no line of demarcation could be seen.

The rules so far promulgated by Lloyd's have been necessarily of a tentative nature and will no doubt be

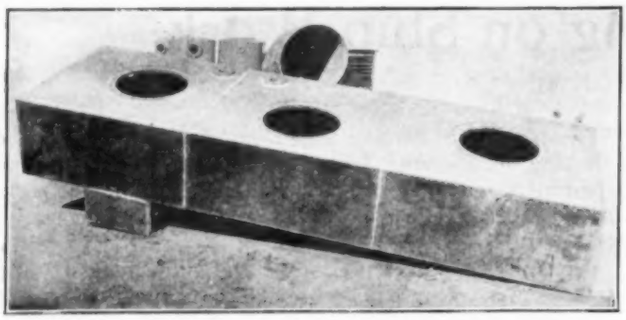


FIG. 2. WELDED FUEL-OIL TANKS

modified and enlarged from time to time in view of the experience that will be gained after welded ships have been in service for a time.

It does not require a great deal of imagination, however, to enable anyone to form the opinion that the shipbuilding industry is on the eve of great modifications in constructional lines, and the guidance given by the tests and comparisons so far made will undoubtedly lead to important, radical departures and developments.

In addition to the increased cost of riveting as compared to welding, it is practically always true that there is a certain percentage of imperfectly fitted rivets, that do nothing more than add weight to the ship. The main purpose of a rivet, of course, is to bind two or more thicknesses of material together, but if the rivet is bent, loses part of its head in the riveting process, or otherwise fails in its proper purpose, there is no method by which such faults can be corrected after the rivet cools. If the importance of the riveted part requires a perfect joint, the faulty rivets must be removed entirely, and this is frequently a time-killing, expensive course to follow. When it is considered that a 5500-ton ship requires approximately 450,000 rivets to bind the various parts and plates and also that a certain percentage of these rivets is not fulfilling the purpose for which they were put into the ship, it is quite evident that practically every ship is burdened with a good-sized load of dead, useless weight. Such defective rivets are, in fact, more than a useless weight, in that they are a menace to the ship, for while they have been built into the ship for a purpose, and are supposed to be fulfilling that purpose, there is no telling how much the ship has been weakened structurally by their failure.

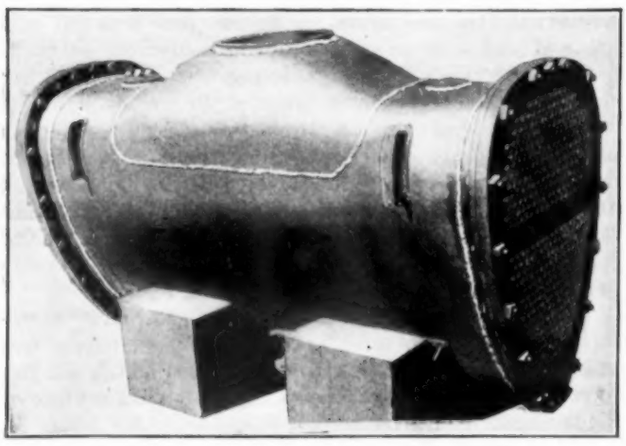


FIG. 3. WELDED STEEL-PLATE CONDENSER. NO RIVETS IN ITS CONSTRUCTION. SIZE 4 X 7 FT.

There are many reasons for defective rivets, and one of the greatest of them is the inaccessibility of the parts to be riveted and the consequent difficulty on the part of the riveter in putting the rivets properly in place. Another reason is that there is no certainty that rivets are at a proper, workable temperature; in consequence of which if they are too cold, the pneumatic hammer now generally used in riveting is unable to round off the end of the rivet properly, so as to insure a proper binding together of the plates the rivet is supposed to hold.

In many cases, when such faulty rivets are discovered, the present-day method is to weld such defective spots, which immediately brings up the natural question as to why the plates should not be welded in the first place.

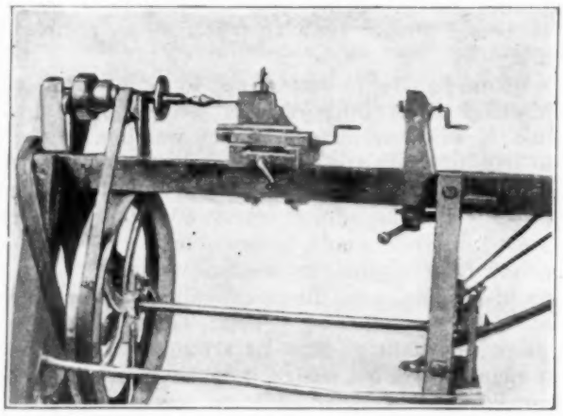
The ability of a welder, using a direct-current, low-voltage arc with automatically regulated current to make sound mechanical welds in cramped, confined spaces, on overhead or vertical walls, in fact, anywhere a man and a wire can go, naturally suggests that welding ship plates together should be the primary operation in shipbuilding; and from present indications and the trend of current events, it seems more than likely that this will be the outcome in the near future.

A Homemade Lathe

By Donald A. Hampson

After some persuasion from a friend, the writer visited an elderly man about 10 miles distant to see a model automatic machine. The workmanship was so good and the model operated so well that it elicited the remark that some good shop must have done the job. "No," replied my new friend, "I did all the work myself, every bit of it, in my own little shop."

Natural interest in that shop disclosed the lathe on which the work was done and it is shown in the accom-



A HOMEMADE LATHE

panying illustration. It is run by foot power, has a compound rest and its bed is made of wood. The only other tool in the shop was a drilling machine, also made of wood. The owner made this lathe as he makes his models; of any old parts he can get of household goods, country blacksmith's and farm-machinery scrap—but never calling on machine shops. What is most remarkable is the fact that he never worked a day anywhere except on the farm, though that did not prevent him from reading, thinking and applying basic principles of physics and machine design to his products.

Contracts and Contractural Relations—II

BY CHESLA C. SHERLOCK

There are certain elements entering into every valid contract which must be present if such contracts are to be enforceable at law. Stated briefly, these elements are: assent or agreement; definiteness or certainty; consideration; mutuality and legality. (Part I appeared Jan. 15.)

IN ORDER for there to be a valid agreement to a subject matter for a contract, there must be parties competent to enter into an agreement. This presupposes a promisor and a promisee. A careful study of the contract relation, and particularly of the decisions upon the point, will convince anyone that the promisor's assent is essential to the formation of a contract. It has been stated so many times by the courts that it is practically undisputed that, except in the case of *quasi* contracts where the assent is supplied by law, no valid contract can exist without the assent of the person on whom the obligation rests.

This, in itself, however, is not sufficient in consensual contracts; for they require the concurrence of intention of both parties, one who promises to do a certain thing and the other who assents to it. Both parties must give their assent to the matter before a valid contract comes into existence, and the assent of one of the parties alone is not sufficient, unless there are circumstances surrounding the case which will give rise to a presumption of law or fact which will supply that assent by fiction.

Since there must be assent on the part of the promisor as well as the promisee, this naturally precludes the possibility of one person giving assent in an individual capacity to himself in a representative capacity. For instance, an officer of a corporation cannot agree with himself to sell himself property of the corporation at a cheap price. One person cannot occupy the position of both parties at the same time.

The law recognizes very clearly the necessity of having parties capable of assenting to the contract. This, of course, is not necessary in the case of *quasi* contracts because the contract there is based upon a duty imposed by law. Since the duty is imposed by law, it may be imposed upon persons incapable of giving assent to a contract as well as those capable of it.

In most instances, where one party is incapable of giving consent to the agreement, the contract is rendered voidable and not void, as one might suppose.

The first test to determine whether a certain person is capable of giving assent to a contract is to look to his legal ability. It is obvious that a person must be of sound mind, and it is desirable that he be of full age. While a minor may enter into valid contracts which will be binding upon him in certain instances, such as for necessities, the rule generally is that his contracts are voidable. This means that he can repudiate them, and even though the other party may faithfully perform his portion of the agreement, he cannot, upon that showing, recover from a minor who repudiates his share of the agreement. It is desirable, then, to be sure on the age proposition.

But aside from these considerations, there are several instances where the law has said that certain persons are incapable of entering into contracts of any nature. A case in point is that of married women at common law. A married woman's legal existence was deemed to have been merged with that of her husband. Having no legal existence she was not deemed capable of entering into contracts on her own behalf after marriage. While this rule has been expressly changed in many states by statutory enactment, it still holds true in those states where no express statute has been passed expressly conferring the right to contract upon married women. Prior to marriage, even at common law, a woman had a right to contract with the same freedom enjoyed by the opposite sex. But marriage destroyed this power. As the old joke went at common law: "Man and woman are one, and man's the one!"

Persons of insufficient mental capacity are not capable of entering into valid contracts. One must be of a sufficiently sound mind to understand the nature of the agreement, to appreciate its effect upon the future or property of the individual, and to be able to freely give consent.

For many years, under the common law, it was believed proper and just to permit persons claiming to be *non compos mentis* the opportunity of proving their insanity in court in defense against their contracts.

But in the time of Lord Coke, it was held to be improper for the courts to allow a man of full age to stultify himself and to set up his own disability in avoidance of his acts.

It was said that if a man is insane and then recovers himself sufficiently to set up his own disability, that he could not, properly speaking, know what he did when he was *non compos mentis.* It was also feared that a great amount of fraud and deception would result if it were permitted to plead insanity in defense of one's own contracts, because it is possible for one to fraudulently pretend insanity with little likelihood of being discovered.

While this opinion held until comparatively recent times, it was argued that it was contrary to the laws of justice and the practice of civilized peoples to prohibit a man from pleading his mental incapacity in defense of his acts. Indeed, one authority has said that the theory that a man should not be permitted to stultify himself has been exploded, and this contention seems to be borne out by the later decisions. And under these decisions, the right rests entirely upon the degree of the insanity of the person.

Business men, then, must be sure that they are doing business with people of sound mental capacity at the time contracts are made, if they are to save themselves harmless from loss, as there is always the possibility of the other party proving his own lack of mental capacity.

It is generally known that persons under the influence of liquor are not deemed at law to be sufficiently capable mentally to enter into valid contracts. Since the passing of the saloon the courts may not be concerned with this matter so much in the future, but it is well to keep it in mind.

The same is true of persons under the influence of any other agency sufficient to rob them of their normal

mental capacity. However, it must at all times be remembered that even though the person may be under the influence of some such other agency, his contracts are not void unless it be shown that he was so far deprived of his mental capacity as not knowing or being capable of understanding the nature of his acts. Persons may be slightly affected but if they still retain sufficient mental powers to understand what they are about their contracts entered into at such a time cannot be said to be wholly void.

In speaking of the matter of capacity, it must be kept in mind that no valid contract arises between parties until there has been a "meeting of the minds" of two parties capable to contract in the eye of the law. This meeting of the minds presupposes that the minds are equal in power to function. The assent must be given and it must be given freely and without coercion, duress, fraud or fear, or by means of any outside agency which interferes with the normal functioning of the normal mind.

This simply means that the assent must have a degree of sufficiency adequate to show what the intention of the parties was. While the minds of the parties must meet, it has been pointed out in many cases that it is not necessary that they should meet at the same instant, though the expression of an intention to give assent at some time in the future is not a sufficient assent to make a valid contract. In Michigan, it was said that a contract was not created in an instance where the matter was entered into in a spirit of fun and frolic.

In another Michigan case, it was pointed out that the meeting of the minds of the parties was not determined by their secret intentions but by their expressed intentions, which often are widely different from their secret intentions.

Contracts are generally formed by the medium of an offer and an acceptance of such offer. In order for an offer to amount to a contract when accepted, it need not be addressed to any particular individual, although it generally is. It may be addressed to the public through advertisements, as has been decided by a number of cases both in this country and in England. But in order to be binding, it is essential that it be definite. A mere vague or indefinite statement cannot be construed to be an offer sufficient to found a contract upon.

One authority says: "An offer, to constitute a contract, must be one which is intended of itself to create legal relations on acceptance, and if it is an offer merely to open negotiations which may ultimately result in a contract it is not binding. An invitation to enter into negotiations is not an offer which can be converted into a contract by acceptance. . . . General offers must therefore be distinguished from general invitations to make offers. Performance of the conditions of the former makes a legally binding contract, whereas compliance with the requirements of the latter is nothing more than an offer which may or may not be accepted by the other party."

Most business contracts today are consummated by means of telephone, telegraph or by mail, for the reason that the bulk of our business is no longer merely local in nature, but is carried on in every section of the country.

The business that is conducted by means of the telephone is governed more or less by the same rules that apply to a conversation face to face. An offer may be given and accepted over the telephone and give rise to a valid contract just as it would had the meeting of the minds taken place while the parties were together personally.

There are two points, however, which for purposes of safety every business man should keep in mind in making trade agreements over the telephone. The first is the possibility of the other party not clearly understanding the offer made. It is well to take particular pains to be sure that the other party understands exactly what you mean.

And at the same time the business man should be making a memorandum of the agreement for reference in the future. This will often serve to avoid costly litigation and to keep the matter straight in case a long time elapses before the terms of the agreement are questioned.

The other point is the likelihood of not being able to have witnesses to the agreement, as would be the case where a contract was entered into by the presence of the parties themselves. Where witnesses are desirable, it is well to connect others to the phone so they can hear the conversation. These points may appear trivial to the busy man, but they are worth the effort, even if they prevent only one law suit in the course of a life time.

Where contracts are transmitted by mail, they reach the other party in the same condition in which they left the offeror. The terms are in writing and are definite and fixed as to their conditions. There is no opportunity for change in the terms.

Offers Made by Telegraph

This is not true in case where the offer is made by telegraph or cable. Through the carelessness or inefficiency of the employees of telegraph companies, these offers often reach the offeree in an entirely different condition from that in which they left the offeror. They may be so entirely changed that the whole nature of the offer has none of the features it had when made.

The question that always arises in cases of this kind is whether or not the offeror is bound to the terms of the offer as delivered to the offeree. This depends entirely upon whether or not the telegraph company is to be considered as the agent of the sender. If it is the agent of the sender, then the sender must be deemed responsible for its negligence.

In earlier decisions in England, it was pointed out that the sender did not enter into such a relation with the telegraph companies as would give rise to an agency; that the telegraph companies were servants of the government and that the government could not be held responsible for the negligence of its employees. There is government ownership in England. Obviously, the same reasoning could not be applied here where we have private ownership.

A majority of the cases decided in this country have been to the effect that where one selects a telegraph company to transmit a message for him that he, for the purpose of the one transaction, constitutes the telegraph company his agent. This means that the sender is bound by any mistakes which may be made, and in case of acceptance by the offeree, he will have to make good to the offeree. Questions as to whether he can in turn recover damages from the telegraph company are not pertinent to this discussion.

The sender's liability, however, is qualified by the question of whether or not the offeree has acted in

good faith or innocence. If the offeree knows that a mistake has been made, or if there is anything about the offer which should lead him to believe that a mistake has been made, he cannot be said to have accepted the offer in entire good faith.

Offers often take the form of continuing offers or options; that is, the offeree is given a certain limited time in which to make up his mind to accept the offer. For some time the courts were in doubt as to the effect of these offers, but they have come to say that they confer no greater rights on the offeree than a mere offer; namely, that the offeree has a privilege to accept the offer before it has been withdrawn, and nothing else. A continuing offer cannot be deemed a contract for the reason that there has not been assent to it on the part of two parties, such as has been necessary to constitute a valid contract.

An offer imposes no mutual obligation until it has been accepted according to its terms, so that if the offer has not been accepted or rejected the matter is still open between the parties. The offer may be rejected or withdrawn, in which case the parties stand precisely as if no offer had been made.

There is no question, in the minds of the authorities, but what the offeror has a right to revoke or withdraw his offer at any time prior to acceptance. While it has been contended quite vigorously at times that an offeror has no right to revoke a continuing offer, or one which is to run for a specified length of time, the courts have not adopted this view. They have announced as a rule, that where one party gives another a definite time in which to accept or reject an offer, that he is not bound to wait until the full time is up to ascertain whether the offer will be accepted or not.

Acceptance, we have seen, is an important element of every offer. In fact, aside from technical points, a contract is nothing more than an offer and an acceptance of a certain proposition. Acceptance must be in the same terms as the offer, and it must relate to the subject matter of the offer and be made in the conditions set out in the offer. It must be definite as to the matter and be made within a reasonable time.

Acceptance cannot ordinarily be made, in part, of an offer and part rejected; for this does not amount to an acceptance of the original offer, but is a new offer.

After acceptance, an offer cannot be rejected any more than it can be withdrawn, for a meeting of the minds has taken place which has created a contract.

Acceptance may be either express or implied. In the latter instance it is inferred from circumstances from which an acceptance can be implied, while in the former instance it may either be by writing, by word of mouth, or by any other communication possible. It is, however, necessary that acceptance be precisely according to the conditions of the offer, if there are any relating to acceptance.

If an offer is communicated under the injunction to wire acceptance, acceptance by mail will not satisfy the terms. If it is desired to have acceptance by letter, and it is given by wire, the same fault can be found, although to give acceptance by two methods when only one is called for is not fatal. It is customary for business men, who wire, to confirm such wires by letter as speedily as possible, in order to avoid any errors which might be committed by the telegraph company. The mere fact that one took an additional precautionary measure would not operate to defeat him of his rights under the contract, for that contract was accepted when the meeting of the minds took place, by assent and fulfillment of the terms.

Acceptance must be within a reasonable time. If no method or manner of acceptance has been set out in the offer, the offeree has a right to use the usual method pursued in his community. He must, however, use all reasonable diligence to see that the acceptance reaches the offeror speedily and without delay.

It is obvious that if the acceptance is not made until after the offer has been withdrawn that there is no contract. Mere silence for the time being will not operate to deprive the offeree of his right to accept the offer, but if he does something from which it can be inferred that he did not intend to accept the offer, he cannot later change his mind, revive the offer and accept it.

The courts have said that where a limitation of time has been placed upon an offer that it is equivalent to a withdrawal of the offer at the time the limit expires. The offer is considered as a continuing one until the time limit expires; that is, it is considered in the nature of being constantly repeated until accepted or until the limit has expired. After that there is no longer any offer, and there is nothing that the offeree can do to revive the offer, unless it is repeated on the part of the offeror. It is not necessary for the offeror to expressly withdraw his offer when the time limit expires. The offer was limited in the first place to a certain date and when that time has passed, the offer no longer exists, having passed out with the time limit.

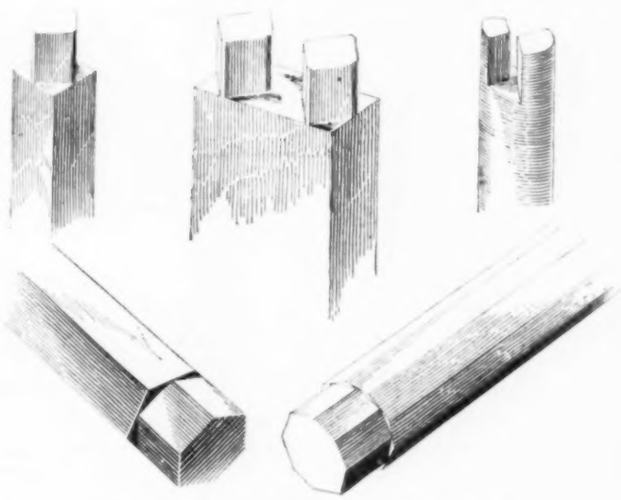
(To be continued)

Making and Using Drifts

By M. J. Zimmer

In reference to H. F. Pusep's article entitled "Making and Using Drifts," on page 757, Vol. 51 of *American Machinist*, I would like to submit the following:

In cutting metal, we are always confronted with the problem of chip removal. It often happens that the

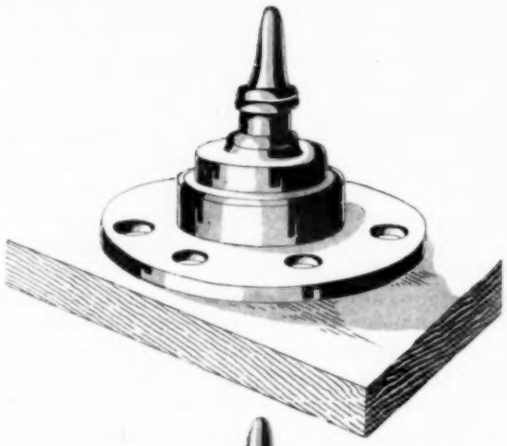


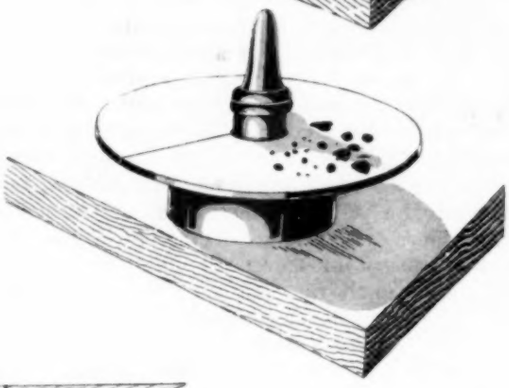
BROACH PILOTS WITH CHIP SPACE

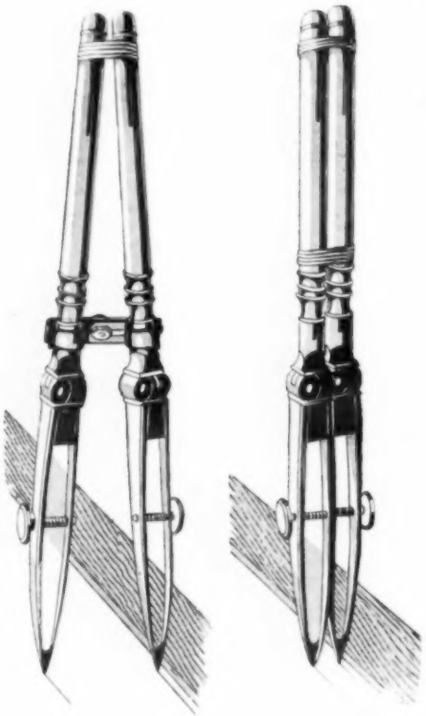
size of a square hole is so small or the hole is so deep that the removing of the surplus metal after the impression has been made, chipping with a chisel or otherwise, is difficult. When this drift is applied to the work, at the first hammer blow the metal to be removed starts crowding to the pilot. It has no other place to go, and the result is a broken pilot and a ruined drift.

FOR SMALL SHOPS *and* ALL SHOPS

By J. A. Lucas







DRAFTING-ROOM KINKS

Industrial Motor Control—I

By C. W. STARKER

The present-day operating requirements of electric motors are so varied that it has been necessary to develop and manufacture a multitude of controlling devices to suit individual conditions. In this and following articles, the author has classified and brought out the distinguishing features of manually operated and automatic industrial control apparatus, for the ready reference of the average semi-technical user.

SMALL fractional horsepower motors require, as a rule, merely a snap or a knife switch for starting purposes. with a protection against overload by fuses. With larger motors, however, the use of a simple switch or "throwing the motor directly on the line," as this is termed, is not permissible on account of the large inrush of current at starting, particularly if the motor is required to start on the load. Such starting would be disturbing or damaging, not only to the motor itself and the driven apparatus, but to other devices on the same circuit. With these sizes, a controller is used which limits the starting current or the starting time and permits a gradual acceleration. There is no definite dividing line beyond which a motor may or may not be thrown directly on the line, as this depends on local conditions and on the design of a motor. Again, local conditions often require modifications of the standard construction of starters. Starters which are to be installed in damp places, or where there is dust or explosive material, should be inclosed, and the resistor protected by suitable moisture-proofing compound. In certain applications, it is practical to use controllers on direct-current motors for sizes as small as ¼ horsepower.

Direct-Current Controllers

A controller is defined by the rules of the Association of Motor Manufacturers (Power Club) as a device which serves to govern, in some predetermined manner, the quantity of electric power to be delivered to the device (motor) driven, and to understand the principle upon which controllers for direct-current motors operate, it is only necessary to have the following two conceptions clear:

(1) If a resistance is inserted in the armature circuit as at *A*, Fig. 1, the counter e.m.f. which must be generated within the motor is less than the full-line voltage for the amount of resistance inserted. The motor, therefore, will run at a slower speed than would be required to generate full-line voltage.

(2) If a resistance *B* is inserted in series with the shunt field winding, the field is weakened, and the motor must therefore run faster in order to generate full-line voltage.

From the foregoing it can be seen that in principle a controller consists of a resistance and means of inserting this resistance in varying predetermined amounts in the circuit. It is obvious that this inserting or cutting out of resistance may be done by manual control, or by automatic means, or a combination of the two, semi-automatic, full-automatic or full-magnetic control. It is apparent, therefore, that there may be armature control only, or field control, or combined armature and field control. The control apparatus may also be designed for adjusting the speed during the starting period only, or for continuous running at various speeds. Apparatus of this type are called starters or speed regulators.

Constructively, the resistance may be made of resistance wire suitably disposed on insulating supports or of grids from cast material. In either case, it should be kept in mind that it is the function of the resistor to transform electrical energy into heat, and that this heat must be dissipated. In selecting control resistance, it is more essential to know the number of watts which the resistor must be capable of carrying and the time period, rather than the horsepower of the motor.

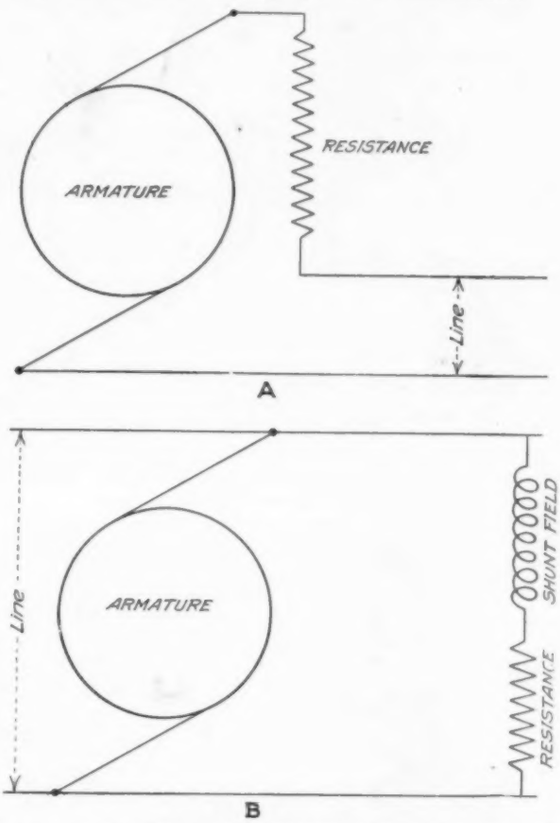
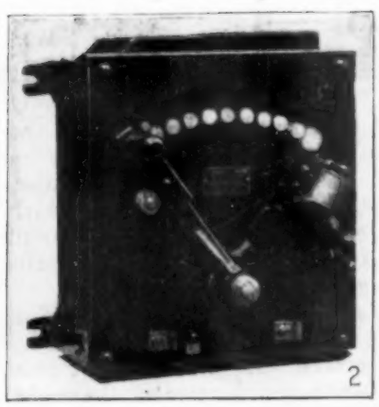
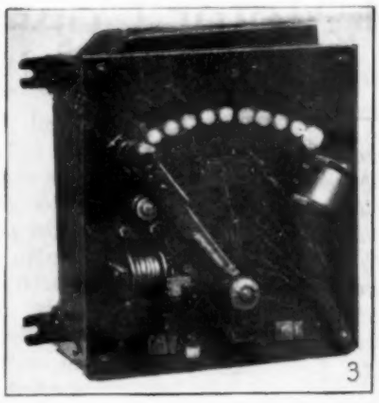


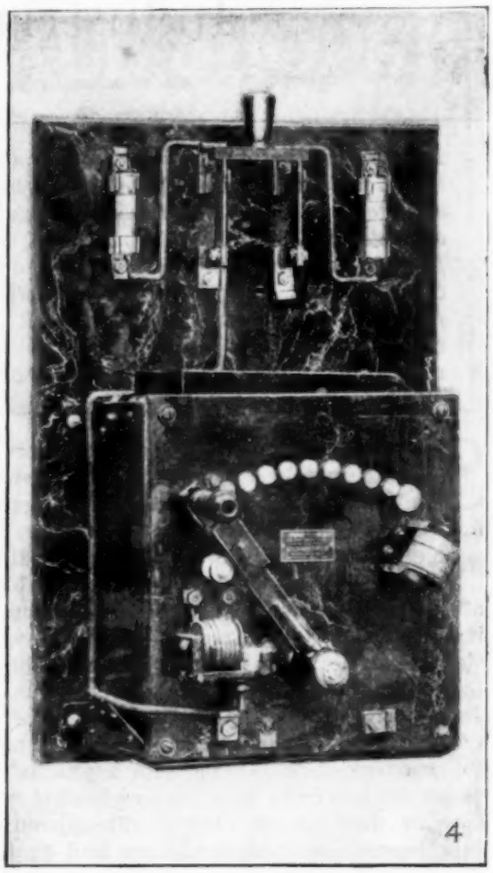
FIG. 1. *A*—CONTROL RESISTANCE INSERTED IN ARMATURE CIRCUIT. *B*—CONTOL RESISTANCE IN SERIES WITH SHUNT FIELD WINDING

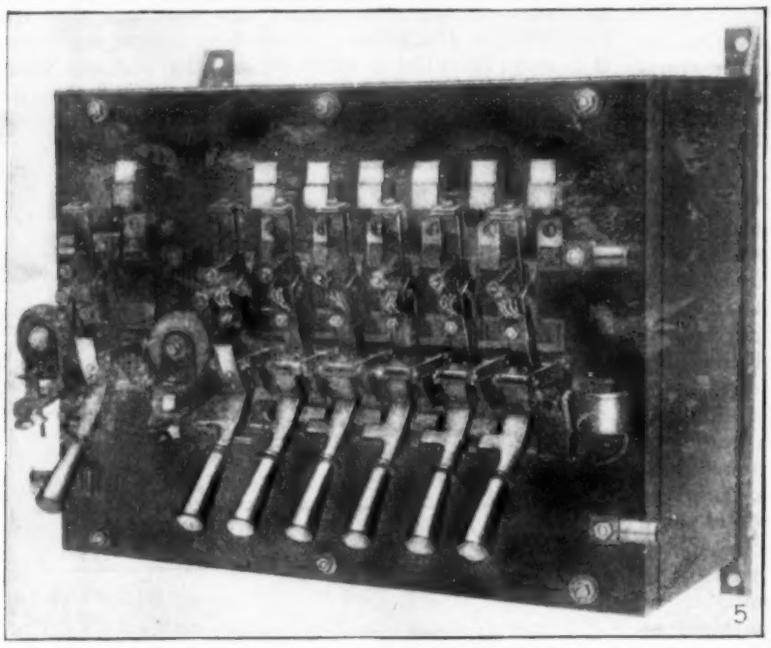
This phase will be touched upon more in detail in connection with the different apparatus.

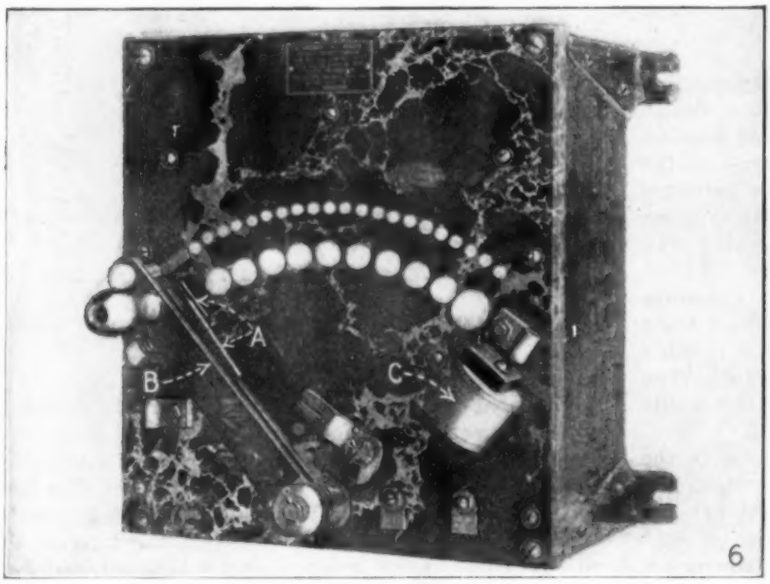
A simple standard-duty, direct-current starter of simple form is shown in Fig. 2. Starters of this type have contact buttons or removable contact segments, according to their capacity, to which the tops of the various points of the resistance are connected, and over which a contact arm or lever is shifted by hand. Commercial starters of this type are designed on the basis of 150 per cent. full-load current, maintained for a starting period varying from 15 sec. to 1 min. A protective device called a low-voltage release is an important detail of the starter, and is usually con-

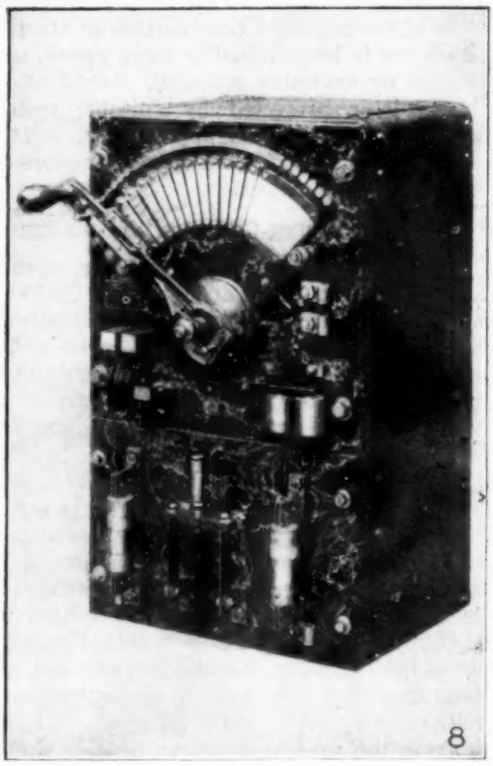












FIGS. 2, 3, 4, 5, 6 AND 8. TYPES OF DIRECT-CURRENT MOTOR STARTERS

Fig. 2—Standard-duty d.c. motor starter with no-voltage release. Fig. 3—Standard-duty d.c. motor starter with no voltage and overload release. Fig. 4—Universal d.c. motor starter with no-voltage and overload release mounted together with switch and fuses on a single panel. Fig. 5—Multiple-switch d.c. motor starter with no-voltage release and overload circuit-breakers. Fig. 6—Compound d.c. motor starter with no-voltage release suitable for machine tools requiring ¼ to 50 hp. Fig. 8—Universal compound d.c. motor speed regulator with no-voltage and overload release, knife switch and fuses, armature and shunt field resistance for speed regulation.

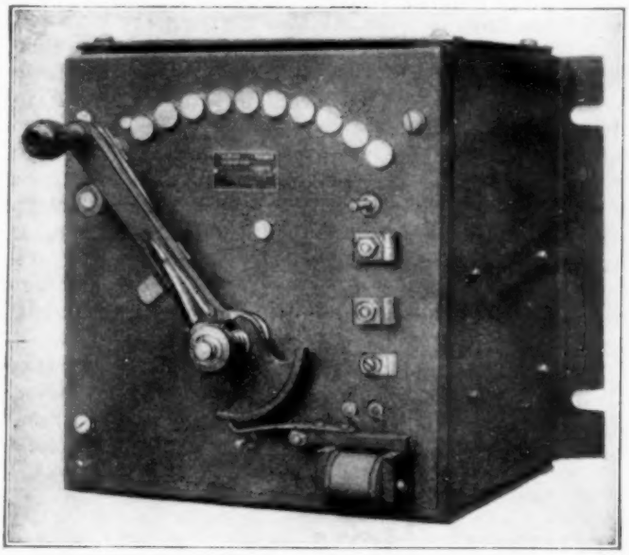


FIG. 7. D.C. MOTOR SPEED REGULATOR WITH SPEED REGULATION BY ARMATURE RESISTANCE ONLY AND NO-VOLTAGE RELEASE

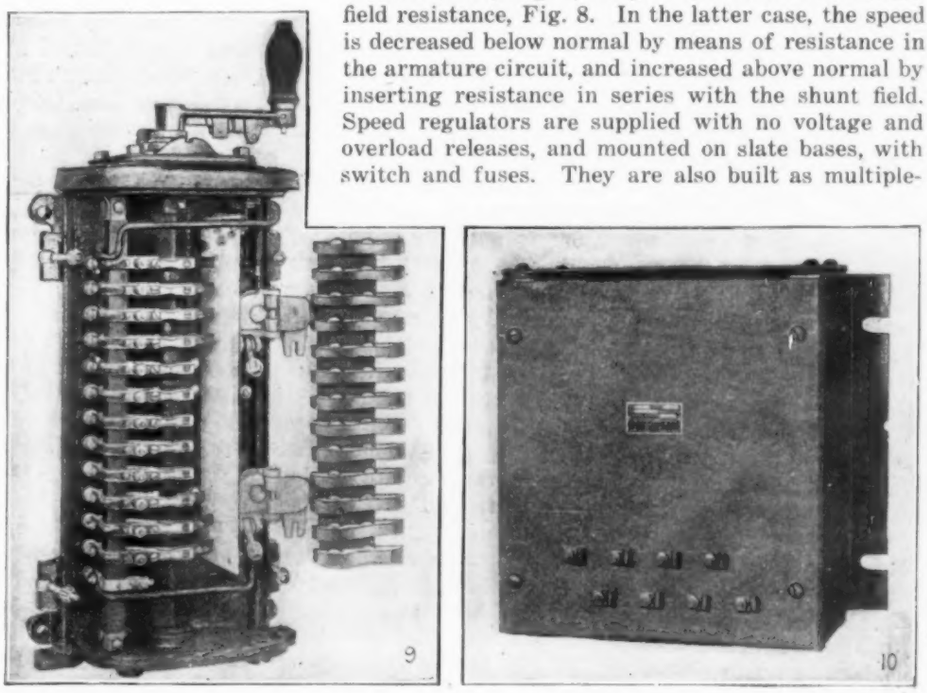
nected in series with the shunt field winding. If the shunt field circuit was accidentally opened, the motor would speed up or run away, thereby damaging the motor or the driven machine as well. This is prevented, however, by the magnet of the no-voltage release which normally holds the controller arm or lever after starting in the run position, and, in case of current failure, this magnet becomes deënergized and releases the lever which is returned by spring to the off position, thereby stopping the motor. With the device just described, it is necessary upon return of the current to return the lever to the starting position and starters of this type should be used on machine tools where serious damage might be done by an unexpected starting up of the motor. Fig. 3 shows a type of starter equipped with no-voltage and overload release relays. The no-voltage release feature is identical to the preceding type, while the overload release consists of a simple relay, which on occasion of excessive overload, short-circuits the release spool, thus allowing the lever of the starter to return to its off position. Fire underwriter rules prescribe that starters should not be mounted directly upon combustible material, and to meet these requirements, the resistance box with all current-carrying parts are mounted on a slate panel. The line switch and fuses are often mounted on the same panel, so as to combine, in one piece of apparatus, everything essential for a complete starting equipment, as shown in Fig. 4.

Multiple-switch starters, Fig. 5, with or without the usual protective features, are preferred for larger motors of 50 to 200 hp. or for very severe service of smaller sizes. These starters have individual switches or contactors which take the place of contact segments or buttons, and are especially designed to handle heavy current and to withstand frequent breaking of the circuit. In starting the motor, the lever at the left is first closed, followed by the others in rotation. In closing the switch in this manner, a time element is introduced between each lever, which prevents accelerating the motor too rapidly.

To meet the demand for variable speeds in machine tools, adjustable-speed motors capable of running at different speeds have been designed. These motors are regulated by compound starters which bring the motor up to normal or full speed by a starting resistance in the armature circuit by means of the contact arm *A*, Fig. 6, which is actuated by the lever *B*. The no-voltage release *C* holds the arm on *A* in the run position while the lever *B* is moved to the left in contact with the series of small buttons. These are connected to a field rheostat which regulates the speed of the motor up to six times normal. In ordering, it is important that the shunt field resistance cold and the shunt field current at maximum speed should be given, in addition to horsepower, voltage and speed range, and, last but not least, manufacturers of these devices can give better service if the serial number of the motor and the name of the manufacturer are also given.

Direct-Current Speed Regulators

Speed regulators for direct-current motors are divided into two classes, fan duty and machine duty. The term, fan duty, signifies a motor load on which the torque increases or decreases as the speed increases or decreases, as in the case of ventilating fans, centrifugal pumps, ice-cream freezers, etc. Machine duty implies a constant torque load such as in certain types of printing presses, positive-pressure blowers, and machine tools. The speed regulation may be by armature resistance alone, Fig. 7, or by both armature and shunt field resistance, Fig. 8. In the latter case, the speed is decreased below normal by means of resistance in the armature circuit, and increased above normal by inserting resistance in series with the shunt field. Speed regulators are supplied with no voltage and overload releases, and mounted on slate bases, with switch and fuses. They are also built as multiple-



FIGS. 9 AND 10. A TYPICAL REVERSIBLE DRUM CONTROLLER WITH FRONT REMOVED AND A UNIT-TYPE RESISTANCE

switch regulators for large capacities, or as regulators with wide speed range using both armature and field control, Fig. 8, for either wall or floor mounting. Operating devices have been designed to meet every demand; by treadle, for lathe, drilling machines, sewing machines and machine tools in general; by rope, for cranes and hoists; by bellows, for air supply for organs; by pressure, for fans, pumps and pressure systems; by vacuum, for vacuum cleaning systems. Reversing controllers of this type are also available for crane, hoist, and small machine-tool service. The resistance with reversing-plate controllers for crane and hoist service is usually proportioned for a speed reduction of 50 per cent. below normal, with 50 to 75 per cent. of normal current flowing. The use of blow-out magnets is desirable with larger sizes to disrupt the arc and prevent burning of the contacts where the circuit is broken.

The foregoing apparatus are of the faceplate type having their contacts mounted on a flat plate. In the drum type, however, the movable contacts are mounted on a cylinder which, by means of a handle, may be rotated so that different movable contacts may be made to slide over stationary contact fingers, as shown in Fig. 9. Controllers of this class are used in service requiring frequent starting and stopping, the speed regulation being had by either armature resistance or by both armature and by field control. The resistance unit, Fig. 10, as well as the protective devices, is installed separately, and may be arranged for non-reversing or reversing service. Drum-type controllers are also easily equipped with different styles of operating devices to meet insulating conditions.

In crane and hoist service, it is possible to take advantage of dynamic braking; that is, the motor, after reaching a certain speed, is automatically transferred into a generator causing it to act as a brake.

The Trade-Trained Boy

BY CLARENCE MACNIVEN
Instructor of Mechanical Drawing, Connecticut State Trade School at New Britain

It is not news to the readers of "American Machinist" that in the evolution through which our industries are passing, conditions have been imposed which seem to have nullified, or at least rendered inadequate the old system of trade training, or apprenticeship. Of the various plans that have been put into execution for the purpose of supplying industry with trade-trained workers, the state trade school idea has probably occupied the most prominent place in public view and has been the target for much criticism, some, at least, of which is undeserved. The following article, the first of a series from the pen of a man who has devoted many years to the study of the problems involved, may serve to give us all a better understanding of the subject.

THE industrial world of today is looking with increasing favor upon the results obtained from the system of public or state trade education, for the reason that it is coming to realize that the problems which engage the attention of the professional instructor—and upon which he is able, by virtue of his position, to concentrate his energy and bring to bear the experience with which years of association with the many-sided human factor have endowed him—are the same in essential details as the problems which must be solved by industry itself in order to meet the constantly growing demand for trained men.

Many industrial concerns have installed departments for the education of prospective employees along lines that will better fit them for the work they are to do. Some of these departments—variously called training departments, vestibule departments, apprentice schools, etc.—devote their attention solely to mechanical or manual training; others teach the students mathematics, English or other studies that may be useful in conjunction with their trades.

Each company, however, attacks the problem from its own individual viewpoint, and students are trained along the lines and to the system that will bring the greatest immediate benefit to the employer, overlooking the fact that the broader the scope of the fundamental training, the less will be the future need for re-training men that have been trained in other shops and to other systems.

I believe that the boy graduate of any trade school should be, as far as possible, familiar with all systems followed in his chosen trade, so that no matter where he may be employed he will not need to be taught over again in order to fit him for his particular job.

Probably no two concerns have precisely the same system, the same way of doing work, but the fact remains that in all concerns the systems and methods follow along lines sufficiently related to enable a boy who has received the broader fundamental training of the trade school to quickly adapt himself to any.

The first and last consideration of the Connecticut State Trade School at New Britain is the boy. We study him; analyze him; find out his likes and dislikes. Some boys are interested in screw machine work; others in gasoline engines, and still others in jigs and fixtures. When we find the kind of work that holds the boy's interest we endeavor to develop him along that line. We visit various concerns that are doing that class of work and learn as much as possible of their methods. We look up the best authorities upon each particular subject, and by combining the information available from all sources, endeavor to formulate a system which shall constitute the broadest possible basis upon which to build the boy's training.

We try to give the boy every opportunity to exercise his own initiative and often find our efforts in this direction justified by the development of original ideas of practical value. It is our aim to make every boy graduated from the school a capable workman, able to hold his place in competition with tradesmen educated by other methods, without the necessity for re-training him to meet the conditions of his employment. In this, we have thus far been successful and practically every boy that has gone out from our school is rendering service satisfactory to his employer.

Employers sometimes ask us to send them undergraduates either for temporary service or for permanent

positions, but this is contrary to our principles. We do not believe in allowing a boy to leave the school until we are satisfied that he has thoroughly mastered the fundamentals of his trade.

Our drawing course is so arranged that a boy may pass almost unconsciously from simple plates to those more complex, from simple projections and intersections to those requiring greater knowledge of detail, from simple machine parts to more and more complicated construction, and finally into original design, his studies being graduated and his steps planned so that in his progress from the elementary to the higher planes, he does not feel the pull.

The Instructor's First Duty

The expressions "I don't understand" or "I can't do it" are seldom heard in our classrooms. It should be the instructor's first duty to discourage this tendency in any boy. Those who "can't," seldom "do"; and, by taking the boy in hand, gaining his confidence and inspiring his confidence in himself, it is usually easy to overcome the difficulty which is largely due to lack of self-confidence and a diffidence due to strange surroundings, for it is generally the new boy that is thus affected.

When a boy has finished with his plates; has reached a stage where he is independent of models and capable of original work, he is given regular commercial work, such as machine parts, tools, jigs and fixtures, etc., which are regularly used in the school shop, or, not infrequently, built to order for some factory outside.

We try to run the drafting department in exactly the same manner that such a department would be run in an industrial establishment. An organization chart that shows the station and duties of each student, is hung on the wall. The chief draftsman gives out the work to the different leaders, who in turn distribute it directly to those boys who are best qualified to do it. When the work is completed it is submitted to the leader, who scans it for possible errors before turning it over to the regular checker for final examination. The checkers are held responsible for each drawing that they sign and pass over to the chief draftsman.

Drawings Checked by Fellow Students

The chief draftsman, as well as the checkers, is a student, and this checking up of drawings by fellow students puts the boys upon their mettle and inspires them with the ambition to get their work through clean and above criticism.

We do not ask the boy to memorize a lot of formulas that can be kept to better advantage in a book than in his head. Each boy is the possessor of a copy of the handbooks of *American Machinist* and *Machinery*, and we thus leave the working out of formulas to the men who compiled these books, keeping the boy's thinking capacity clear for work on his own constructive problems.

The boys are not allowed to fall behind in their complementary studies. Each student is obliged to devote a certain time each day to the study of English and mathematics, and it is as important that his averages are kept up in these studies as faithfully as in the more mechanical ones.

We sometimes overestimate a boy's mental capacity, but oftener our error is in the other direction and we are agreeably surprised at his capability. I believe the average boy's mind is underestimated, and that any boy has the power of right thinking along these lines if he is properly instructed and if he is taught the art of mental concentration which develops the subconscious mind that we use so much and yet know so little about.

I do not contend that we have the only or the right answer to the problem of supplying the world's need of trained men but I know we are getting results. We try to acquire the viewpoint of the employer's needs by putting ourselves in his shoes, so to speak—by visiting factories where work similar to ours is being carried forward and by adapting the methods we find there to meet our requirements.

We aim to so equip our boys that when they step out of our school into the world of industry they will be capable of taking up their duties upon the firm basis of a broad, comprehensive knowledge of the fundamental principles of their trade that will adapt them to meet whatever conditions may confront them. That we are successful is amply attested by the satisfaction of the employers of our graduates and the urgent demand for more to fill vacant positions.

Apprentices—American and European

By K. Saldiz

Permit me to relate from my experience—which is the experience of most of the foreign-born mechanics—why the European mechanic is more skillful than the domestic product. The American boy is in every respect superior to the European boy except in the matter of obedience; therefore, the difference in skill would seem to find its explanation in apprenticeship methods, but length of time is not the deciding factor.

Now let us see what happens to the embryo mechanic. In my time (twenty-six years ago), twelve years was the school age. Those desiring to go in apprenticeship, informed the school superintendent and were allowed to finish their studies one month ahead of time.

Out of school, they went to a shop (chosen by their parents mostly) for three months' trial, in order to find out the ability and inclination of the boy. After three months, if everything was satisfactory to all parties concerned, a contract was drawn up for from three to five years and sworn to by the parents or guardian of the boy as well as the master. The contract was a legal obligation that could not be broken by either party without penalty and could be cancelled only on the ground of cruelty to the boy or insufficient instruction in the trade.

The boy worked all day (quality—not quantity—was expected) and spoiled a lot of time and materials. He got plenty of good advice on how to do it right next time and a few wallops (same not being recognized as cruelty) to make him remember the advice. The masters were not stingy with either advice or wallops, both being considered necessary for the good of the boy's future.

Besides absorbing the rudiments of the trade all day, with forceful assistance if necessary, in the evening the boy had to go to school three times a week, from 7 to 10 p.m. The classes being graded, he received instruction in grammar, business management and correspondence, bookkeeping, shop mathematics, etc. Sunday, from 8 a.m. to 1 p.m. he studied mechanical drawing and design.

The attendance was compulsory and no expense to the boy attached. Play "hookie?" Not on your life. The boy had a book in which the date of attendance was stamped, the master being required to countersign. If the stamp was missing, the boy got what was coming to him from the master, who was held responsible, under penalty, for the boy going to school regularly. If the signature of the master was missing, the boy got it (not the signature) in school. So, *willy-nilly*, the boy had to get trained. If he ran away, the strong arm of the law brought him back and he was made to realize that a contract may not be broken.

It is impossible to measure the value of this lesson in stick-to-it-iveness, and that is one of the indispensables of a good mechanic in the making.

The boys in the United States have all the advantages, except compulsion. I speak of compulsion as an advantage because, so far as I know, American boys (including my own son), when apprenticed, prefer play to school, which is natural but does not help to turn out good mechanics. A boy getting from three to five years of this kind of training will not ask a fellow workman for the loan of a "bevel subtractor," nor, when looking for work and being asked his training, answer: Oh hell! I want a job. Both these cases have come under my observation.

I do not say that the methods outlined above are the best or the only ones, but it is certainly a good thing to keep the boy to one trade. And here the parents are to blame, in most cases. A boy should not be expected to make a living while learning a trade. I know of several concerns where first-class mechanics are turned out, after four years' apprenticeship, but they do not pay as much as others, where the boy is a producing unit. Also, even after the European boy is a journeyman, he sticks to his trade, because he is compelled to do so.

Interesting Mrs. Machinist

BY GEO. W. CHILDS

Referring to the article, "Johnson Interests Mrs. Machinist," by John R. Godfrey, page 701 of *American Machinist*, it is the writer's opinion that Johnson is on the right track.

I was brought up in the old-fashioned shop and firmly believe that it was that sort of thing that helped the employer to get close to the men and their families and that made employees think as well of, and take as much interest and pride in their place of employment as they did in their own homes.

I graduated from a large industrial plant in a thriving manufacturing town of 20,000 inhabitants where the owners knew not only their employees (about 600 of them) but their wives and children as well; where every employee would have fought at the drop of the hat, not only for their employers but for their families too.

I was with the firm nearly 10 years and not once during that time can I recall any "spirit of unrest" or grievance against the firm.

Believe me, that was, and is today, some works. They have been going along without a shutdown for over 50 years. The owners, being men brought up in the shops, knew a mechanic and a good job, and did not hesitate to slap a man on the back and give him credit for his work.

Those were the days of the apprenticeship system and a boy had to be some boy to get a chance in that shop to learn a trade at $2 a week to begin with, and to have learned a trade there was a sure guarantee that a mechanic knew his business.

Several years ago, when times were dull, I happened to be in another manufacturing town looking for an engineering job. I was informed by the chief engineer that he had nothing to offer me and really did not have any more than enough work on hand to keep his force busy. I then told him that I came from the shop mentioned above and he immediately said, "I will make work for you. We have several of their old employees; they all make good and I dislike to turn one down."

I believe that if men in charge today would look out for the little things, and apply the Golden Rule a little more, many of our troubles would disappear.

How Do You Meet the New Man?*

Do you ever try to make the new man feel that he's welcome?

He has a hard lot at first. He comes into a new organization, meets a lot of fellows he's never seen before, handles work that is perhaps more exacting than any work he's ever worked on before, gets blueprints the like of which are found no where else (because of the necessity for accuracy and precision) and by the end of the day he begins to wonder if he wouldn't do better to look around for a job that wasn't so full of hard problems.

He's bordering on the edge of discouragement and "quit without notice."

You can help us cut that down. Before a man is hired he must have received the approval of the employment manager and the final approval of the foreman of the department.

Granted that they make as many mistakes as the average individual they're not always going to make the same mistakes—so, one checking the other means that the new man must possess a lot of the qualifications we require.

Regardless of how good the new man may be, if he is not made welcome in the department he starts under a handicap.

If the fellow at his side grouches and snarls he begins to think that maybe he isn't working in such a good place. If the fellows all run away at lunch time without tipping him off how to get to the restaurant we fall another notch in his estimation. If he gets a piecework job, and one of the men tells him he'll have to "kill himself to make out," he marks up the talk about the "square deal" as "bull" and wishes for the end of the day so he can quit and hunt some other place.

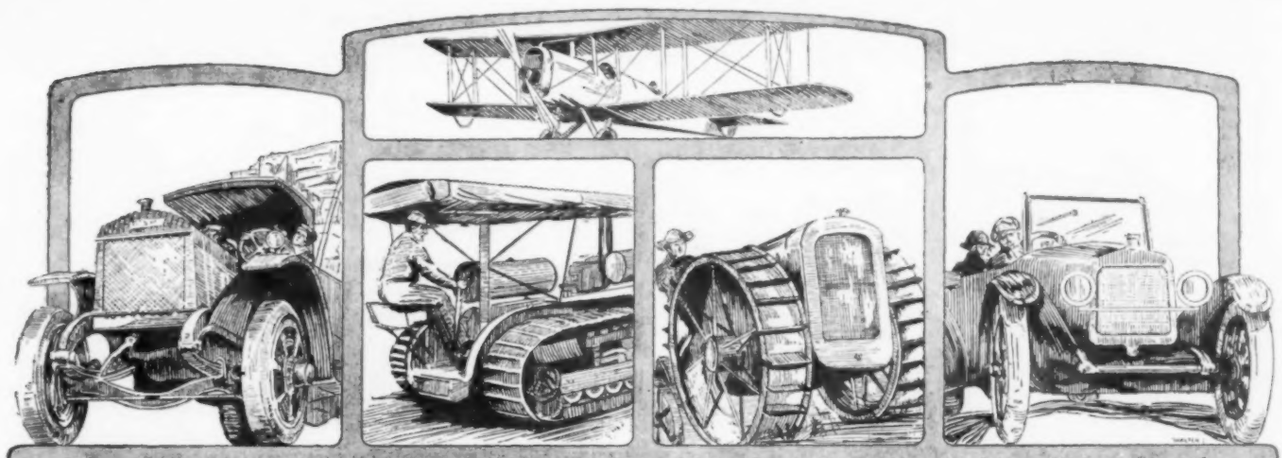
Think more of the new man. Help him over the hard spots. Tell him about the restaurant, toilets, production system, and other good points of the plant.

Let's all help to keep these good men interested. Put yourself in his place. You went through it once. You know how it feels and how grateful you were to the fellows who helped you out.

The new man gets his urge to make good from those around him.

You do your part—and in most cases he'll do his!

*From the "Center Punch," published by the American Multigraph Company.



AUTOMOTIVE CONSTRUCTION

Some Details of Airplane Manufacture

By FRED H. COLVIN
Principal Associate Editor, *American Machinist*

The growth of airplane manufacture brings new problems to the shop man who must for the present combine small production with economical methods. A study of some of the fittings will show how great a problem this is in some cases. This will also serve to impress those who remember the crude construction of earlier machines, with the great advances in the mechanical design of important details.

ALTHOUGH the Glenn Martin Co. did not receive orders for their bombing machines in time to have them render real service in actual warfare, their capacity and reliability were thoroughly demonstrated in this country, and their satisfactory performance was acknowledged by all who are familiar with aircraft. The end of the war found them with a number of fighting machines under way, but a transformation is now being made and the view in Fig. 1 shows in the assembling department a commercial machine designed for carrying six passengers in the foreground. The first step is to assemble the upper or horizontal longerons on the assembling stand in front, and, after the framework has been tied together by struts and ten-

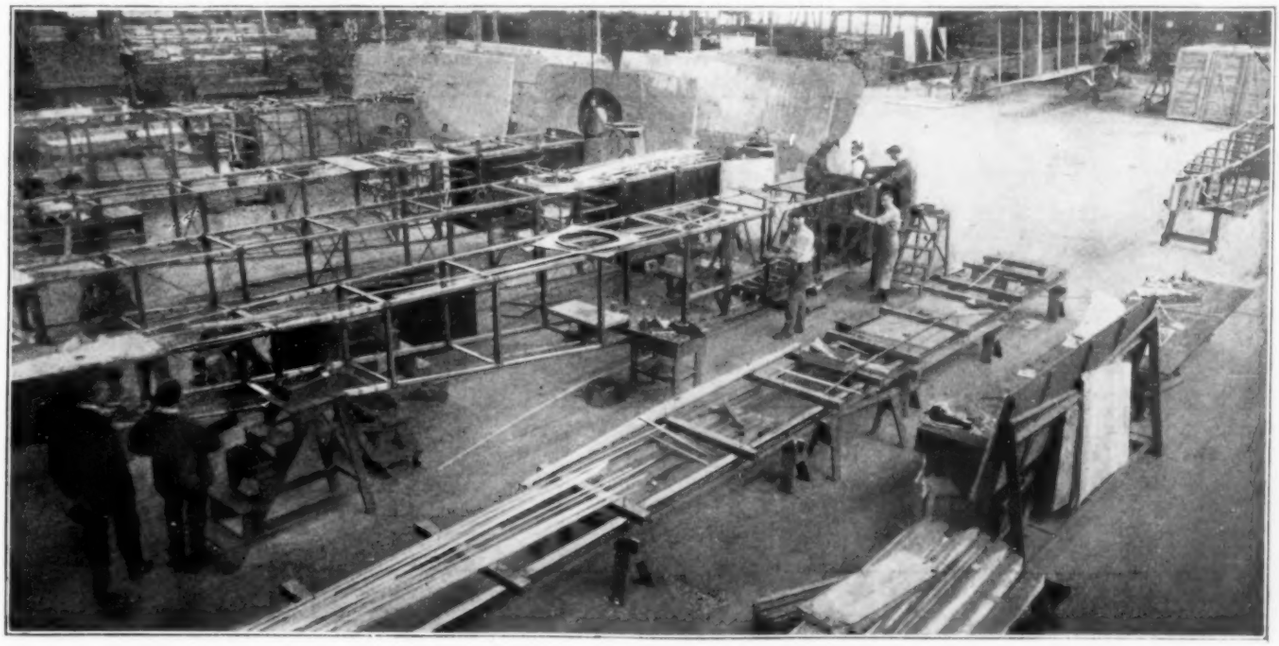


FIG. 1. GENERAL VIEW OF ASSEMBLING SHOP

AUTOMOTIVE CONSTRUCTION

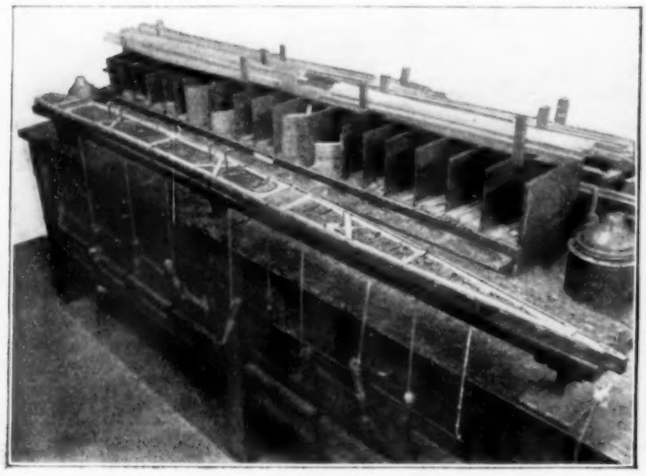


FIG. 2. BEGINNING A WING-RIB ASSEMBLY

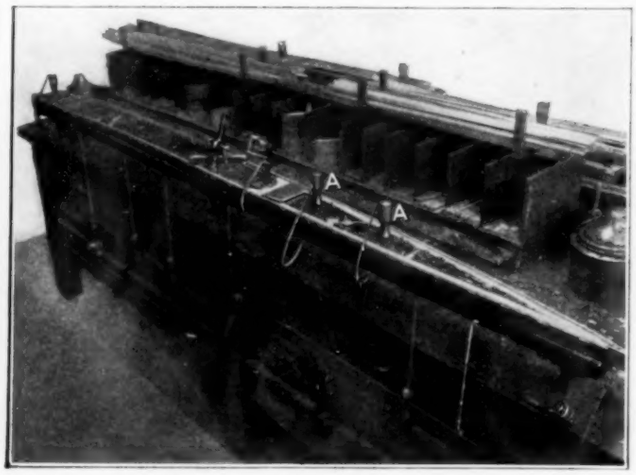


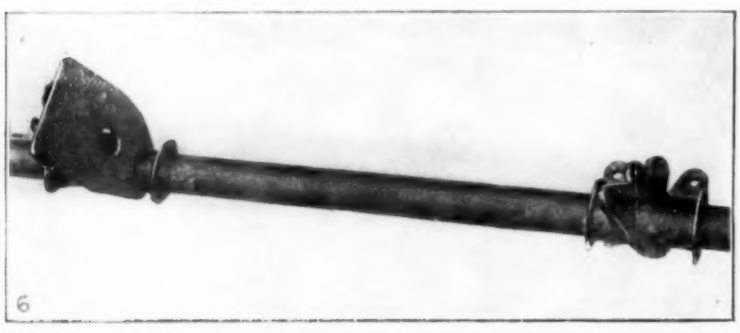
FIG. 3. CLAMPING RIB PARTS FOR NAILING

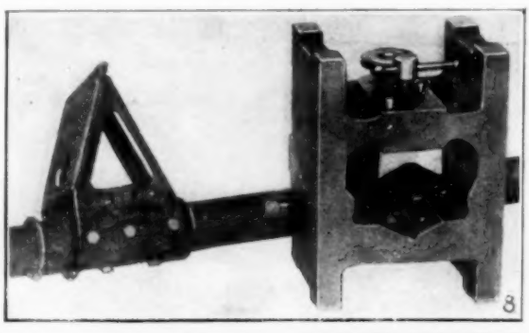
sion wires, the fuselage is turned over into the position shown for its finishing touches. The machines at the left are for military purposes. The gun mount is shown in position, as is also the huge gasoline tank indicating a large cruising radius. The machine in the distance is not a Martin but a Caproni, which nosed over into the mud on landing at the Martin field.

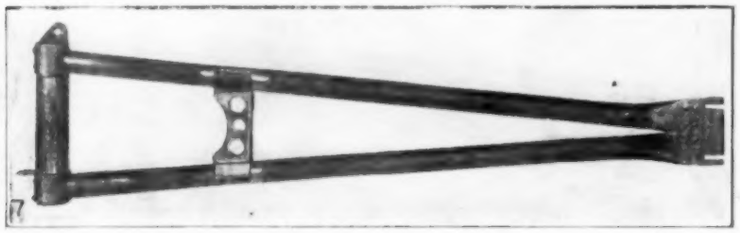
While there is a tendency to substitute metal in many places, the wing ribs are still being made of spruce, the various component members being cut to exact sizes, inspected and numbered, and brought to the assembling bench shown in Figs. 2 and 3. Fig. 2 shows the wing rib partly assembled, while Fig. 3 shows the same bench and fixture but with the blocks spread by the taper pins *A*, thus forcing the various pieces into their correct positions while the outer strips are being nailed into place through the openings.

FIG. 4. BRAZING METAL AILERON FRAME

As in all careful work of this kind, particular attention is paid to the condition of the glue, which, as will be seen, is electrically heated. It is especially prepared every morning in order to secure the best results. The building up of metal framework is shown in Fig. 4, which is a layout bench and brazing stand for the frame of the ailerons, these being made of steel tubing. Both brazing and







FIGS. 6 TO 9. VARIOUS FITTINGS

Fig. 6—Two angular strut fittings. Fig. 7—Triangular metal fitting. Fig. 8—Fitting and drill jig. Fig. 9—Strut end fitting.

AUTOMOTIVE CONSTRUCTION

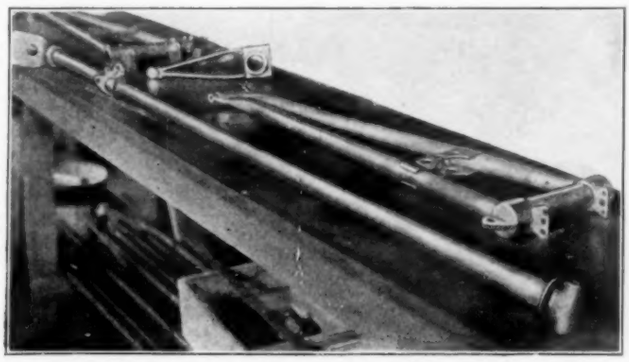


FIG. 5. LAYOUT BENCH FOR METAL PARTS

soldering are used in these fittings, the surplus metal being trimmed off on the stand shown in background.

Another assembling stand or surface plate is shown in Fig. 5, where the long struts are laid out and placed in correct position for brazing. The strut in the foreground forms part of the landing gear and contains some very intricate fittings owing to the different angles at which some of the plates must be located. Two of these are shown in detail in Fig. 6. They are built up from flat pieces and brazed or welded in position. The details of one of the pieces shown in Fig. 5 can be seen in Fig. 7, this being a substantial brace which must withstand considerable pressure.

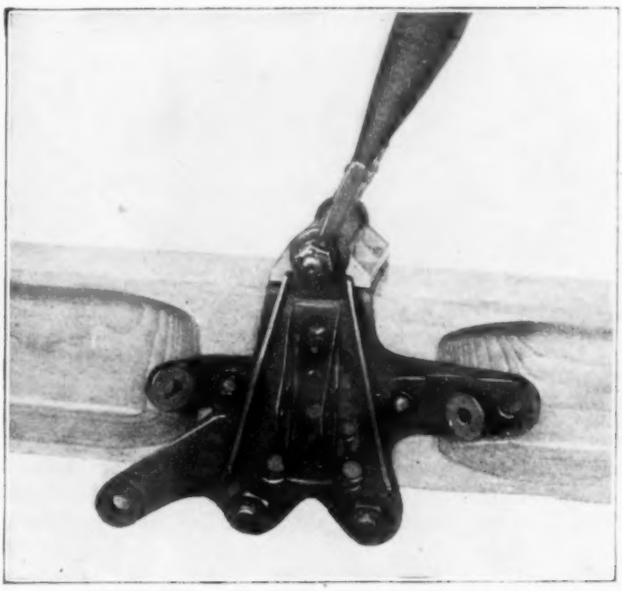


FIG. 12. A FITTING IN PLACE

Another view of the strut fittings is shown in Fig. 8, together with the drilling fixture used in connection with it. This also gives a good idea of the fitting itself and the way in which it must be built up around the barrel of the thimble. Another fitting, which, though

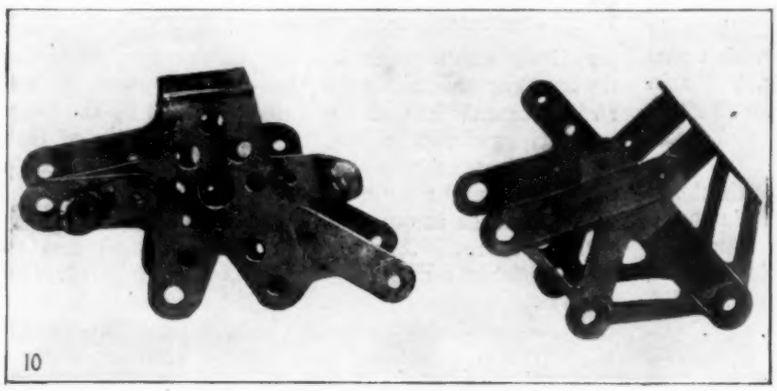


FIG. 10. TWO FITTINGS COMPLETED

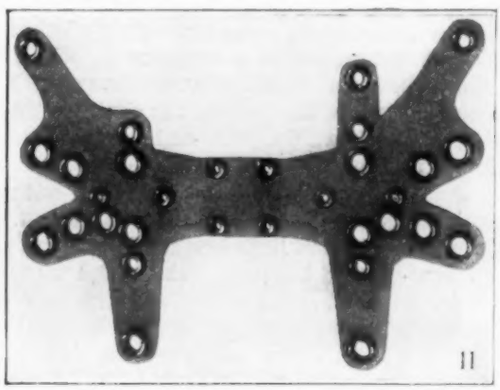


FIG. 11. DRILL JIG FOR LONGERON FITTING

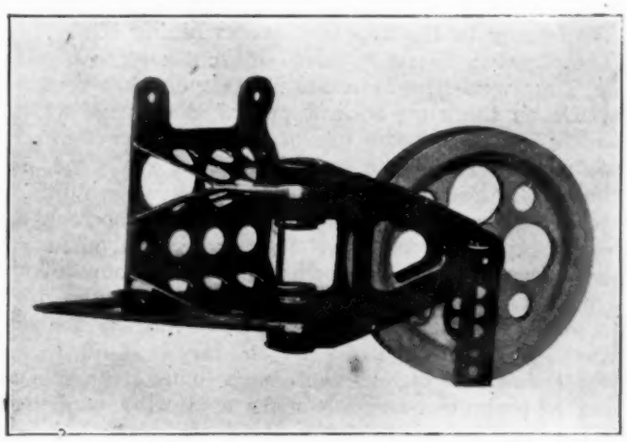


FIG. 13. CONTROL PULLEY AND STAND

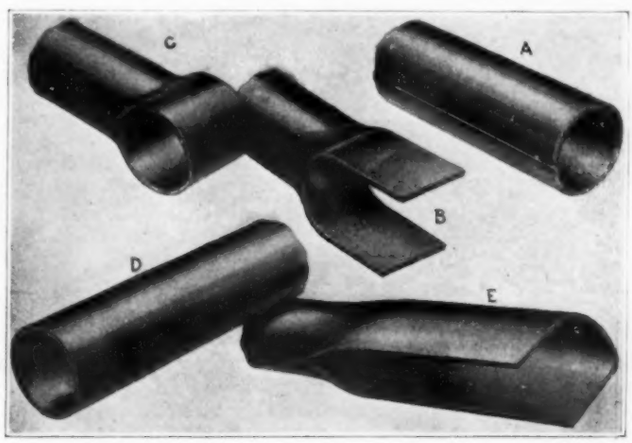
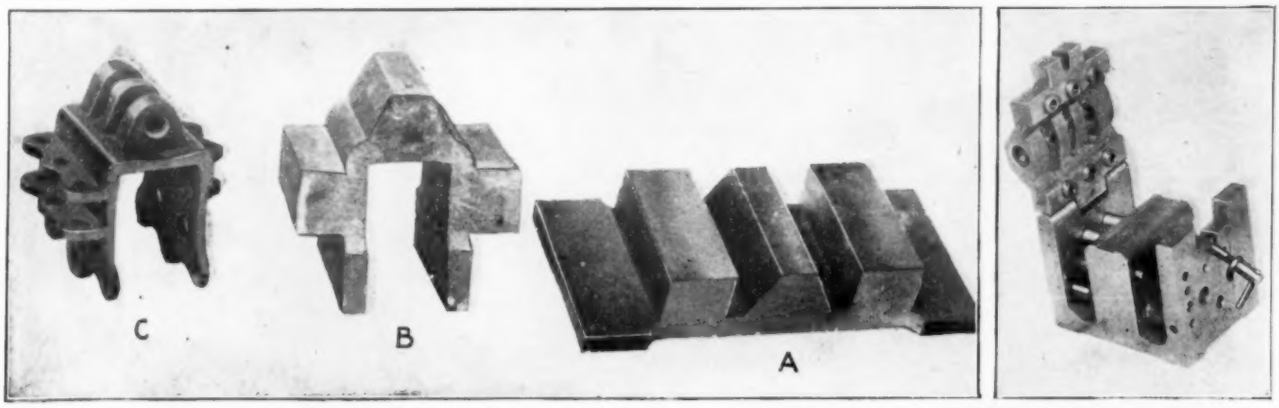


FIG. 14. HOW TUBE ENDS ARE SHAPED

AUTOMOTIVE CONSTRUCTION



FIGS. 16 AND 17. MACHINING THE HEAVY FITTING, AND SHOWING HOW IT IS DRILLED

comparatively simple, must be built of several pieces, is shown in Fig. 9. This requires little explanation. Two longeron fittings are shown in Fig. 10, these being bent-up sheet metal after being drilled and otherwise lightened. They have reinforcing strips on the side as well as ears to which such attachments can be made.

HOLES DRILLED BEFORE BENDING

Fig. 11 shows the jig, which is practically the shape of the developed flat piece, and in which all the holes are drilled before bending. One of these fittings is shown in position on a longeron in Fig. 12 which also shows how the angular brace shown in Fig. 7 fits in between two of the ears of the fitting. The small bearing block shown in position is of aluminum and takes the thrust of the triangular fitting.

Another fitting used in connection with a wheel for guiding control cables is shown in Fig. 13. This shows how strength and lightness can be secured by using perforated steel of the proper shape and proportions.

An interesting method of shaping tube ends for different purposes is shown in Fig. 14. In the first case, the tube is split for a comparatively short distance along the center line on each side as at *A*. The ends are then flattened as at *B* and finally shaped around a suitable mandrel as at *C*, which gives the proper shaped fitting. The cross piece is then fitted in position and the whole thing brazed, after which the desired connection is ready for use. A somewhat different fitting of a similar nature is also shown in the same illustration. The tube is split on one side as at *D* and this is then opened out as at *E*, a suitable form being employed for this purpose. This is a variation of the old art of coppersmithing which finds many opportunities in airplane work of the present day when the quantities being built are comparatively small. It is this lack of quantity production that makes the cost of a well-built airplane so high at the present time, and is well illustrated by the longeron fittings shown in Fig. 15. There are four of these fittings on each plane, these forming the connections for the struts in the main part of the fuselage. The particular fittings in question are shown at *A*, *B*, *C* and *D*. These are made of chrome vanadium steel and are worked out of a solid slab as shown at *A*, Fig. 16. This shows one of these fittings after it has been machined on the shaping machine ready for bending. The piece is heated for the bending operation, *B* showing it ready for final machining. The fitting is finished in the milling machine as shown at *C*, the holes being drilled in the special fixtures shown in Fig. 17.

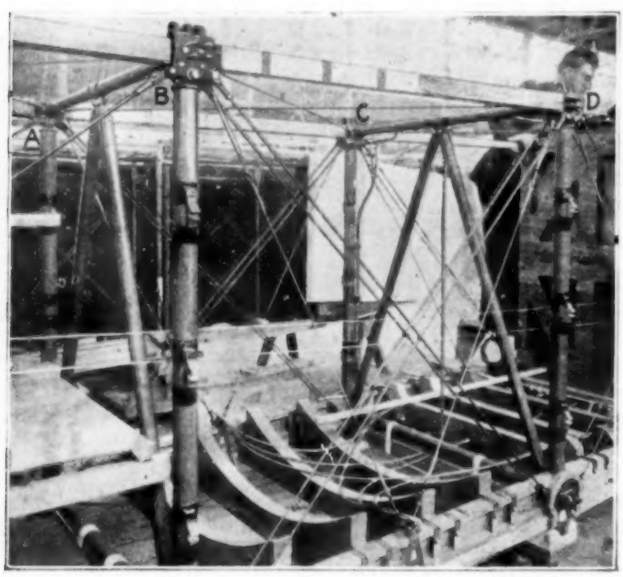
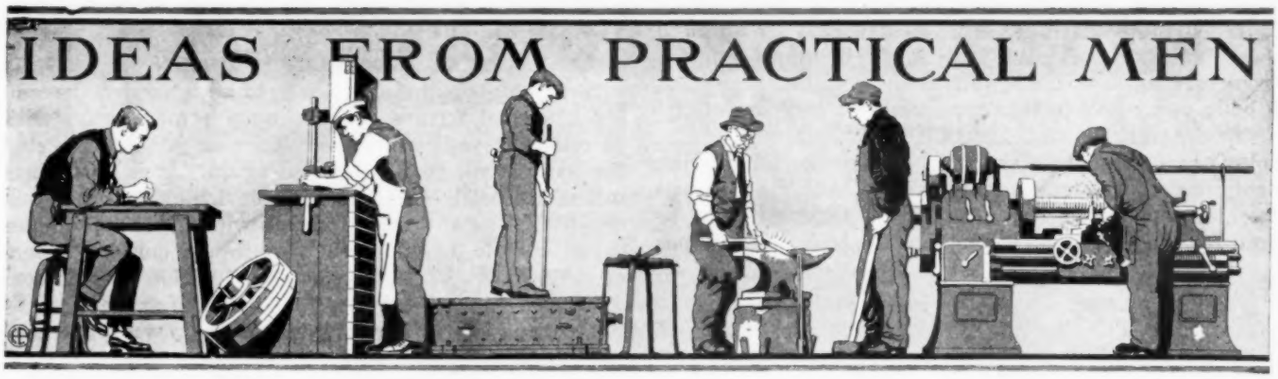


FIG. 15. HEAVY FITTINGS IN PLACE

Criticism of Section Lining Kink

BY GEORGE W. CHILDS

Referring to the article "Section Lining Kinks," by H. A. Hayden, page 824, Vol. 51 of the *American Machinist*, I am wondering whether Mr. Hayden has read my article on the same subject published on page 322 in which I criticised the use of "section liners" of any make. I would like to know how many real good, old-time draftsmen find it necessary to use such useless tools in order to help draw their pay envelopes. Also, how many real good chief draftsmen would allow one to be used in drawing rooms under their supervision. I do not mean some of the chaps who had the nerve to go around and pose as draftsmen during the war times. I mean by a draftsman, the kind of a chap who chews tobacco, cusses, takes a drink if he can get one, and who can not only make a drawing of general heavy and light machinery, buildings, etc., but who can create in his own mind original designs.

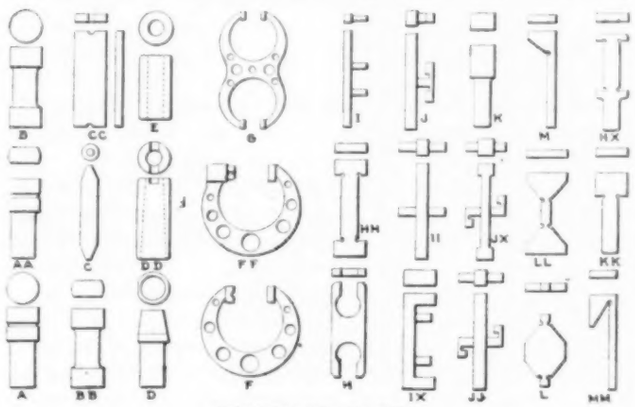


Standard Inspection Gages

By O. H. Gerlat

In production work it is necessary to have duplicate gages to be used by the machine operator and the inspector, and it is desirable that these gages be held as closely as possible to a standard type, thereby eliminating a great amount of work in the drafting room, and also saving time in teaching operators how to use them.

By having a set of gages drawn and lettered according to type, the person ordering needs only to specify



STANDARD GAGES

the type of gage desired, the high and low limits, and to send along with the order a print of the part it is to be used on.

A set of gages as shown in the illustration can be used to advantage on automobile and tractor production.

A. Two limit, single end, sound plug; to be used on small, narrow work.

AA. Two limit, single end, flat plug. This gage has an advantage over a round plug, as the user can tell when a hole is out of round.

B. Two limit, double end, round plug; to be used on small, wide work.

BB. Two limit, double end, flat plug. This gage has the same advantage over *B* as *AA* has over *A*.

C. Single limit bar or pin gage; to be used on large holes.

CC. Two limit, bar gage; to be used on large holes.

D. Two limit, male taper gage.

DD. Two limit, female taper gage.

E. Single limit, ring; very useful on valve stems, kingpin, etc.

F. Two limit, snap; useful in measuring large diameters.

FF. Two limit, adjustable snap; also useful on large diameters.

G. Two limit, double end, snap (large diameter); can also be made in adjustable type.

H. Two limit, double end, snap (narrow); used on small diameters.

HH. Two limit, double end, snap (wide); to be used on large, narrow diameters.

I. Two limit, single side, depth gage.

IX. Two limit, straddle depth gage; useful in measuring over a ridge.

II. Two limit, two side, depth gage; very useful when work will not allow both pins to be on one side.

J. Two limit, single side, hook gage.

JJ. Two limit, two side, hook gage; used when work will not permit single side hook.

JX. Two limit, straddle hook gage; used in measuring over ridges.

K. Two limit, square, groove gage.

L. Two limit, internal bevel; useful on small bevel gears.

LL. Two limit, external bevel; useful on small bevel gears.

M. Single limit, obtuse bevel; useful on large bevel gears.

MM. Single limit, acute bevel; useful on large bevel gears.

KK. Two limit, flat, groove gage; used in measuring a groove in a bore.

HX. Two limit, double end, hub gage.

A Friction-Driven Drilling and Tapping Head

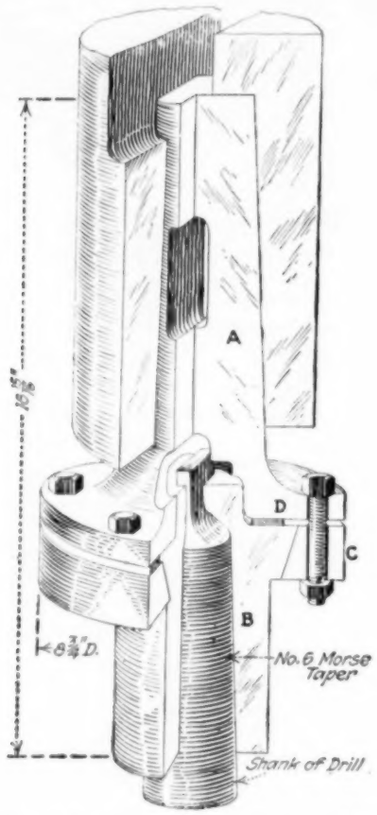
By Harry F. Pannepacker

The illustration shows a friction tapping head designed for drilling and tapping holes ranging from $2\frac{1}{2}$ to 4 in. in diameter and from $2\frac{1}{2}$ to 4 in. deep in nickel-steel armor plate. The drilling is done on a post drilling machine, using successively a flat drill, a bottoming drill and a special boring head for recessing or undercutting for clearance so that the taps can be run clear to the bottom of the hole. Following this operation, the holes are rough-threaded with a single-point tool held in the boring head, the drilling machine having been designed and fitted with change gears for this purpose.

The tapping had previously been done by hand, using five taps consecutively. The work was placed on trestles at a convenient height from the floor and the taps turned in by means of a long tap wrench. Seven men—a leader and six helpers—were assigned to this job and the time required to complete one hole averaged 20 minutes.

Some opposition to the idea of tapping by power developed because it was thought that the threads would be torn out or stripped, but as this trouble was sometimes experienced even with the hand-tapping method, it was finally decided to proceed with the experiment, the result being the tapping head here described.

The shank *A* of the tool was fitted to the spindle of the drilling machine, a dowel key passing through the spindle and the shank assisting in holding the latter from turning or twisting out of the spindle. The head *B* has a taper hole to take the shanks of drills or special tools that may be used in it. The upper end of the hole is made the right shape to receive the tang which projects a short distance through the head. An elliptical hole though the shank enables a taper drift to be used for the purpose of taking out the tools. The upper



FRICTION-DRIVEN TAPPING DEVICE

end of the head *B* is turned to fit a recess in the shank, thereby steadying and holding it in a central position.

The brass collar *C* holds the head to the shank by means of six machine bolts equally spaced around it. A tapered shoulder on the head fits a correspondingly tapered bore in the collar, furnishing one of the friction driving surfaces, the fiber ring *D* being the opposing surface. The friction may be increased or decreased to suit conditions by adjusting the six holding bolts.

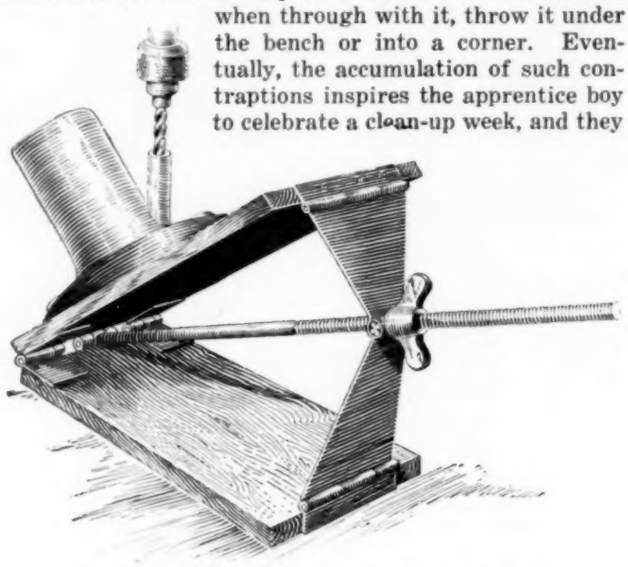
The holes in the work are drilled, recessed, and roughthreaded as if for hand tapping; the shanks of the tools used fit the tapered hole in the head. This hole is squared to $2\frac{13}{32}$ in. (the size of the square on the largest tap) to a depth of $2\frac{1}{2}$ in. Smaller taps are accommodated by short adapters, one end fitting this squared recess and the other end having in each case a squared recess to fit the square of a certain sized tap.

Instead of using five taps to each hole, only the second and fifth taps are used, reducing the time of tapping by more than one-half; while the work is done by the two men handling the drilling machine, thus reducing the number of men required from seven to two.

Adjustable Angle Plate for Job Shop

By Wm. Denton

In a job shop there is likely to be a sudden demand for a special fixture for use upon some repair, with no certainty that when the particular job is completed the fixture will ever be needed again. It is customary in such cases to cobble up some device out of wood and when through with it, throw it under the bench or into a corner. Eventually, the accumulation of such contraptions inspires the apprentice boy to celebrate a clean-up week, and they



AN ADJUSTABLE ANGLE PLATE OF WOOD

are broken up and used to start a fire under the boiler —usually the day before some one of them is wanted for a "repeat order."

When there is a job of drilling to be done at an angle other than a right angle to any surface upon which the work might rest, the favorite custom is to hunt up a wooden box that is not quite big enough to hold the job and let the work stand cornerwise in it at an angle somewhere near the one desired.

The illustration shows an adjustable angle plate made of wood and some old hinges, that is just as good for many purposes as one made of cast iron with more elaborate tilting devices. It does not cost much more to make than it usually does to hunt up the right size box, and is enough better to warrant keeping it in the tool crib. The construction is so obvious from the picture that no description is needed.

Are Toolmakers Ignorant of Drifts?

By Amos Ferber

On page 757, Vol. 51 of the *American Machinist*, is an article by H. F. Pusep, "Making and Using Drifts," which carries ample evidence of the author's familiarity with the tool he describes. I would, however, question the statement in his opening paragraph that its "mysteries * * * are almost a closed book to the majority of younger mechanics."

I have met but few diemakers, old or young, who were not tolerably conversant with this tool; which is practically indispensable to the makers of small piercing and blanking dies. Some are more familiar with it than others—that is, some realize its possibilities to a greater extent, exercise greater care in making it, and use it to better advantage—but this condition is a matter of personality and is equally true of a lathe.

Annual S.A.E. Meeting

The annual meeting of the Society of Automotive Engineers was held Jan. 6 to 8 at the Engineering Building, New York. The Standards Committee, which occupied the first session, had for consideration the following subjects: Aluminum alloys, ball bearings, ball-and-socket joints, brake shaft bushings, cast-iron carburetor flanges, connecting rods and bolts, engine support arms, generator mountings, grinding wheel sizes, high chromium steel, kerosene-engine testing forms, malleable iron, marine reverse couplings, motor-boat control levers, motorcycle spark-plug shells, nickel steel, pneumatic tires, radiator and fuel-tank caps, roller transmission chains, side lamp glasses, solid tires, spline fittings, stationary-engine testing forms, taper fittings, trap-door belt feed, trap-door flywheel housings, trailer hitches, tungsten steel, motor capacity rating and water-tight flanges.

The second session was devoted to business, with the exception of a symposium on the "Needs and Tendencies of Engine Design," by F. H. Trego and L. H. Pomeroy. Retiring President Manly pointed out the dangers which beset any society in getting into ruts and not daring to go outside of the beaten paths in engineering matters. The automotive industry is particularly fortunate in having few traditions and much depends upon a continuation of this policy.

In his paper on the above subject, Mr. Trego contended that the supporting of crankshaft bearings by hanging them from an aluminum crankcase is out of date, and suggests that we should follow the practice of letting crankshaft bearing bolts clear through the crankcase and the cylinder base, using them as holding-down studs for the cylinders as well. These bolts should be of large size and threaded into the case at the lower end to prevent the crankcase from falling down when the cylinders are removed. This construction would act as a support, using the aluminum crankcase as a spacer only and tying the bearings firmly to the cast-iron cylinder block.

Mr. Trego also pointed out the effect of heating the carburetor at various speeds. At all speeds from 400 to 2,800 r.p.m., less power was developed with hot air than without it. He further advocated that the intake passages should be made as small as possible without the loss of too much power at the higher speed. He sums up with the suggestions to close the intake valve early, have the intake passages small, and to apply heat to the gas mixture *after* it leaves the carburetor.

The paper by L. H. Pomeroy on "Tendencies in Engine Design" dealt with several phases of the problem, summed up as follows: The effort toward obtaining absolute mechanical reliability, the application of modern views of gasoline-engine thermodynamics, improvements in mechanical efficiency, improvements in engine balancing, improvements in carburetion and the capacity to deal with low-grade fuels, the principles of light engine design and the cleanness of the design. Mr. Pomeroy points out that the engineer is far less limited in this country than in Europe in attaining his end and for this reason the goal of complete mechanical reliability is well within sight when an automobile will be as reliable as a watch.

Engine speed is no longer limited by considerations of piston temperature, owing to the use of aluminum pistons allowing the designer to adopt large bore cylinders if he desires. He also points out the possibilities arising from the use of forged aluminum connecting rods in reducing the inertia effect of the big end of connecting rods. Mr. Pomeroy's paper contains numerous illustrations, and details will appear in a later issue.

The subject of Aluminum Pistons was considered at length by E. G. Dunn, while the paper on "Automotive Steam System," by L. L. Scott tended to keep alive interest in the steam car.

"Automobile Body Design," by William Brewster, gave the experience of many years in custom body design and manufacture. "Springs and Spring Suspension," by E. Savory, set forth without the use of complicated mathematical analysis, the elements to be considered in the design of vehicle suspensions; while a paper by Benjamin Liebowitz dealt with the measurement of vehicle vibrations. Other papers were:

"Adapting Engines to Use Available Fuels," by J. G. Vincent, deals with various methods for handling present fuels, including a novel method applied in one instance. "High-Speed Indicators," by P. S. Tice, Thomas Midgley, Jr., and H. C. Dickinson. "Super-Chargers and Super-Charging Engines," by Major Geo. E. A. Hallett, gives the results of tests at McCook Field in high altitude flying. "Velocity of Flame Propagation in Engine Cylinders," by R. K. Honoman and Donald McKenzie, shows how the experiments were conducted.

"Dilution of Engine Lubricants by Fuel," by Gustave S. Kramer, dealt with a subject of interest to all engine users and leads the author to believe that new features in engine design are necessary to prevent the accumulation of liquid fuel in the cylinders and the lubricating system.

"Bettering the Efficiency of Existing Engines," by H. G. Gibson, outlined various methods of meeting the increasing demand for more efficient engine operation. This dealt constructively with the problems of improving car performances through the use of equipment for better handling of present fuels.

Prof. O. C. Berry, of Purdue University, presented a paper dealing with "Mixture Requirements of Automobile Engines," covering tests under a number of different conditions of load, speed and mixture. Then there were papers on "Fuel Blends," by Dr. Joseph E. Pogue, and "Thermodynamics of Carburetion," by C. F. Hopewell. Some well qualified engineers consider that blended fuels will probably be widely used in the near future while the data bearing upon the many problems encountered in carburetor research make both of these papers of extreme interest. The usual S. A. E. dinner took place in the Grand Ballroom, Hotel Astor, on Jan. 8, with over 1500 diners and a long list of disappointed late comers.

A Compulsory Metric System and—YOU

Do you realize that there is a well organized movement under way to get a bill through the NEXT session of Congress making the metric system COMPULSORY?

Many Congressmen have been convinced by the pro-metric propaganda of the World Trade Club of San Francisco, that there is a real public demand for the metric system.

This so-called "club" which is merely the nom de plume of a millionaire with a hobby, sent out thousands of circular letters all over the country and, as a consequence, a miscellaneous collection of approximately 58,000 pro-metric letters has been sent to Washington.

This has been done in an endeavor to prove to the Committee on Coinage, Weights and Measures, and others, that the salvation of American industry lies in the adoption of the metric system.

If a compulsory metric system were adopted now American industry would be set back so far that Germany would be on her feet again before we could recover.

Machine tool builders are one solid unit in opposing metric adoption, and would suffer the most by its compulsory use.

The Machine Tool business is the backbone of the whole industrial system. Without it the entire industrial body would collapse.

Without machine tools not even the steel mills could obtain machines to turn out their product. Printing presses, textile

machinery, steam hammers, mining machinery, and the vast amount of machinery that supplies our every-day wants—are *all* the offspring of the machine tool.

Only the very crudest and lowest grade of machine of *any* kind can be built without the use of machine tools—and the compulsory use of the metric system would hopelessly cripple the machine tool builders for many years and add millions of dollars to the cost and throw thousands of people out of work during the readjustment period.

One well known machine tool builder said the change from the English to the metric system would cost him $500,000 and cripple him for two years. He is already a year behind on his deliveries, and his machines are urgently needed in scores of manufacturing plants, anxious to get to work on material needed in the world's markets.

Delay caused by any change in the system of measurement means non-employment and expense to many—in other words the American people, will, in the final analysis, pay heavily for the unwarranted interference with our measuring system.

Now Mr. Toolbuilder and Mr. Machinery Manufacturer, it is up to *You* to counteract the poisonous propaganda of the prometric people. And Mr. Shop Man, it is up to you, too.

Write or see YOUR Congressman and tell him the plain cold facts as to what any change in our system of measurement would mean to *you* and to the American people who are dependent on the products of machinery—as *all* of us are.

Act, *everyone of you*, and do it QUICK.

Thos. Viall

Editor

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

Taylor & Fenn Two-Spindle Spline Milling Machine

The two-spindle spline milling machine described and illustrated in this article, has been recently placed on the market by the Taylor & Fenn Co., Hartford, Conn.

This machine, which was designed by B. M. W. Hanson, is automatic in operation and will simultaneously machine two spline grooves on opposite sides of the same piece, single splines of the same or different dimensions simultaneously on two pieces, or through slots such as drift-pin slots or cutter slots in boring bars and similar work.

A V-shaped vise affords a positive clamp for the work beyond the cutter traverse at one end while the other end, if centered, is supported on a male center and if uncentered is supported in a female cone. Long work is free to project beyond the confines of the machine at both front and back.

It is claimed that splines of exact duplicate lengths and uniform finish and accuracy can be produced in a minimum period of time, the duration of which, of course, depends on the length, width and depth of the spline and the cutting resistance of the metal being worked.

No countershaft is necessary, as the drive is direct from a pulley on the line shaft to a tight and loose pulley to the left at the rear of the machine. The shifter rod extends through to the front of the machine where all other controls are located.

The spindle speeds are obtained from a speed box within the column and the controls are within easy reach of the operator when in operating position in front of the machine. The machine must be stopped while speeds are being changed, thus providing positive protection against damaged gearing. The speed gears are of alloy steel, hardened, and run in an oil bath.

The table feeds are obtained from a speed box containing a cone of five gears and a two-speed clutch, controlled from the front of the machine. Each one of the table feeds is available with each one of the spindle speed graduations.

The work table obtains its motion through a lever from a cam mounted at the front under the work slide of the machine. This cam is driven by shafts and gears from the feed box. A simple, easily adjusted mechanism is provided whereby the table movement may be varied from zero to the maximum of six inches.

The feeds to the spindle housings are transmitted through crank and link mechanism from a cam mounted behind the table reciprocating cam.

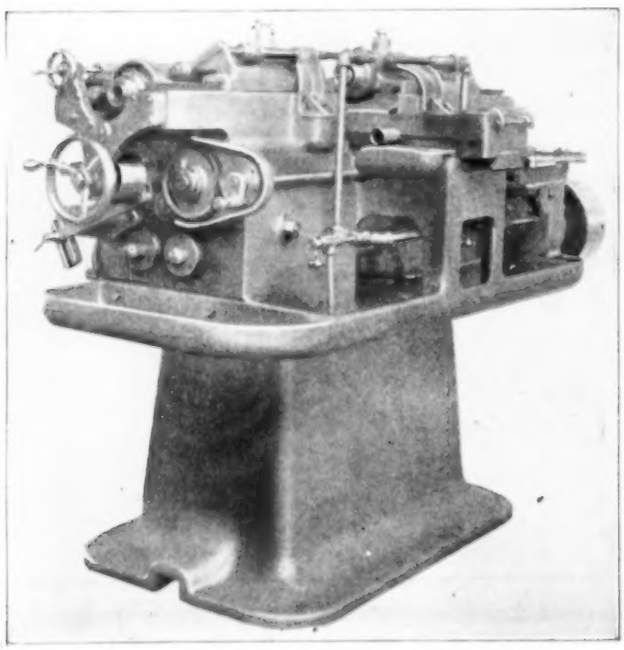


FIG. 1. TAYLOR & FENN SPLINE MILLING MACHINE

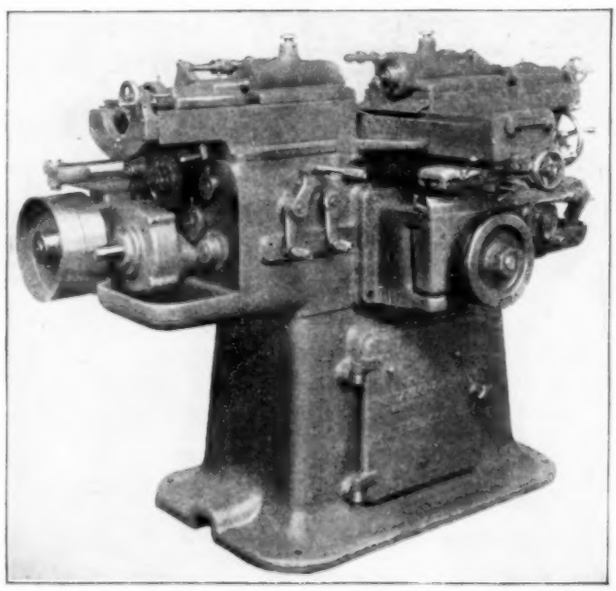


FIG. 2. TAYLOR & FENN SPLINE MILLING MACHINE (SIDE AND REAR)

Specifications: Will spline work up to 5 in. in diameter and 6 in. long; longer work may be splined by resetting; spindle speeds, (6) from 302 to 1,885 r.p.m.; table feeds, 10.

The depth to which it is desired to sink the cutters into the work, is controlled by handwheels at the ends of the machine.

When the machine is started the feed mechanism causes two feed nuts to rotate but as they are held against lengthwise movement, the screws push the two opposed cutter heads inwardly against the pressure of compression springs. Feeding of the cutter heads continues until the predetermined depth is reached at which point the screws run out of the nuts and feeding stops. In cases where the slot is milled through, as for instance the drift slot in drilling-machine spindles, it becomes necessary to avoid leaving a small fin in the center of the work. This is accomplished by withdrawing one cutter just before it reaches the center of the work and allowing the other cutter to continue its feed movement beyond the center. After the center of the work has been passed by this cutter the head which carries it recedes. This synchronized movement of the cutter heads is of course performed automatically by power.

A reservoir for the cutting lubricant is secured to the door of the column within the body of the machine. When the door is opened this reservoir swings out with it and the supply of cutting lubricant can be readily replenished or the reservoir cleaned. The coolant pump is driven at constant speed from the main drive pulley, thus making the supply of coolant uniform at all times and independent of the speed at which the cutters are driven. From the pump the coolant passes through a system of telescopic tubes to the hollow cutter spindles. Passing through the spindles and through grooves in the shanks of the cutters it is projected under considerable pressure direct onto the lips of the cutters, cooling them and at the same time ejecting any chips immediately they are formed.

Provision is made so that the table, attached fixture and work as a unit are easily and quickly adjusted from the front of the machine to exact relation with the cutters after the work has been clamped to approximate position in the fixture.

The locations of the cutter lips in the splines are at all times indicated on an easily read, plain flat scale on the spindle adjustment slide to the right of the machine.

The cutters can at will be made to advance either in unison or alternately and either to knock off in unison or alternately.

Safety Wrench for Hopper Cars

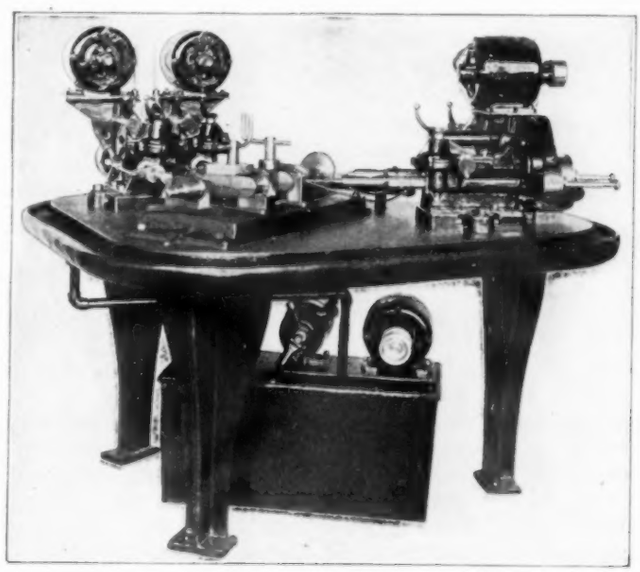
Opening a drop-bottom car with an ordinary wrench is, at times, a risky undertaking due to the loaded door sticking, when the catch is released, and then suddenly falling when it is forced open by the load. In such a case the wrench would "kick back" in a violent manner, endangering the operator. As a guard against such accidents, the safety wrench shown in the illustration has been developed. It is said to have automatic features that protect the workman at all times against injury, when opening the car; also that the car can be opened much quicker than by the usual method. The handle is offset, to permit free movement, and two pawls are provided for the ratchet, one of which is ready to act in case the door should stick. In operation, the car dog is held up and the wrench lowered with a quick motion; the pawl will then automatically spring out, allowing the hopper door to drop. If the door does not start, the handle is raised and then pressed down, thus forcing the door open.

SAFETY WRENCH FOR HOPPER CARS

The socket of the wrench takes a secure hold on the square of the shaft, even when the shaft is in a battered condition. A bushing or special socket, for smaller shafts, can be furnished if required. The wrench is made from electric process steel castings of high tensile strength. It is being marketed by the Safety Wrench and Appliance Co., 13th and Cherry Streets, Philadelphia, Pa.

Harrington Crankshaft Oil-Hole Drilling Machine

Edwin Harrington, Son & Co., Inc., 17th and Callowhill Sts., Philadelphia, Pa., has brought out a machine for drilling oil holes in the rod bearings of crankshafts. The machine, as shown in the illustration, is provided with four spindles, each having its own driving motor and feed control. The spindle heads are mounted in pairs on plates that permit adjustment of the distance between the spindle noses and the work.



HARRINGTON CRANKSHAFT OIL-HOLE DRILLING MACHINE

Specifications: Drilling capacity in steel, $\frac{5}{16}$-in. holes; distance between spindles, maximum 10½ in., minimum 7⅜ in.; spindle traverse, 8 in.; height, spindles above table 4¾ in., table above floor, 31 in.; taper hole in spindles, Morse No. 2; spindle speeds, 1000 r.p.m.; feeds per revolution of spindle, 0.002, 0.003, 0.004 and 0.005 in.; size of each motor, ¾ hp.; speed of each motor, 1750 r.p.m.; floor space, 69 x 48 in.; weight, without motors 2150 lb., with motors 2415 pounds.

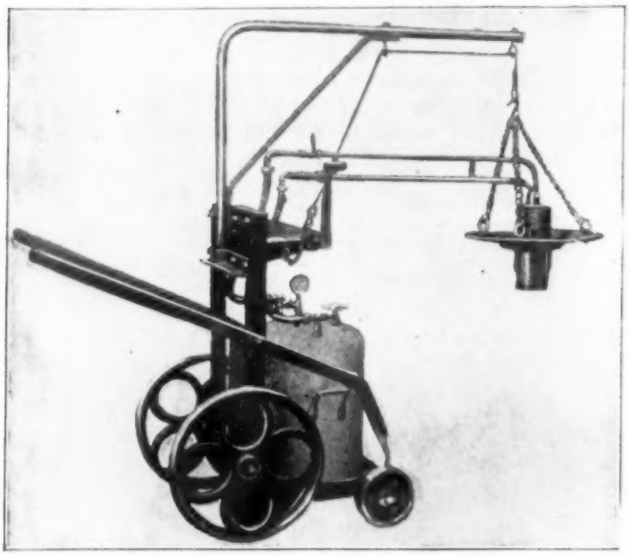
The spindle drive is through belts from the motors to pulleys at the rear of the spindles and the belt tension is taken by ball bearings so arranged as to relieve the spindles from belt strain. Only one spindle speed is provided for, but permanent changes in speed may be made by changing the motor pulleys. The spindles run in long sleeves having bearings their full length. The feed is by the usual rack and pinion, the drive being by spur gears through worm gearing and

so arranged that the driven gear may be changed to get different rates of feed. Provision is made for disengaging the feed either by hand or automatically at any predetermined point.

The plates on which the heads are mounted are provided with T-slots to allow changing of spindle center distances. The tank and two pumps for cutting lubricant comprise a separate motor-driven unit, which is placed on the floor beneath the machine. With the exception of the jig the machine is furnished complete as shown.

"Hauck" Drier for Bull Ladles

The Hauck Manufacturing Co., Brooklyn, N. Y., is manufacturing a portable drying device that is said to heat thoroughly and dry the lining of a fifty-ton ladle in 15 min. or less, depending upon the amount of heat supplied. The apparatus comprises a 20-gal. steel oil

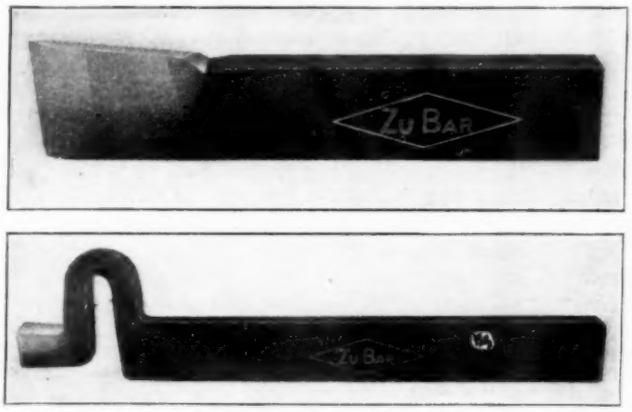


"HAUCK" DRIER FOR BULL LADLES

tank equipped with a 150-lb. pressure gage, oil and air regulating valve; one length of special oil-resisting hose; one length of high-pressure air hose, and one burner with a long handle and deflecting plate. The tank is mounted on a truck that is well built of angle iron and provided with two substantial 18-in. wheels and two wheels of smaller size. Attached to the truck is a davit, from which is suspended by a steel cable the burner and deflecting plate which may be raised or lowered by means of a small windlass. The burner which operates with compressed air at a pressure from 20 to 100 lb., burns fuel oil, crude oil or kerosene, and lights instantly. The flame spreads evenly and quickly and is directed downward toward the bottom of the ladle. The drier heats the bottom and sides of the ladle white-hot, if required, and it is claimed to be a more efficient and less expensive method than the use of wood fires.

Zubar Tipped Tools

A special method of welding a high-speed-steel tip to a shank of inexpensive material has been developed by the Zubar Manufacturing Co., Inc., 5701 McMahon Ave., Germantown, Philadelphia, Pa. By this method it is claimed the weld is effected over the entire surface of contact between the two metals so that the possibility of the tip breaking off at the joint is reduced to a minimum. This line of tools includes all standard shapes and sizes and is furnished in special shapes to suit requirements. The design is intended to combine



ZUBAR TIPPED TOOLS

the advantages of a solid forged tool such as heat conductance, strength, etc., with the economical features of the built-up tool. The material in the shank allows the tool to "give" before it will break and the tip may be rehardened at any time in the usual way. The tools can be tipped with any make of high-speed steel desired by the customer and are furnished ground, ready for use.

"Strand" Link-Type Flexible Shaft

N. A. Strand & Co., 549 West Washington Boulevard, Chicago, Ill., is making the Link-type flexible shaft together with its couplings shown in the illustration. It

"STRAND" LINK-TYPE FLEXIBLE SHAFT

Specifications: Standard length, 7 ft.; links, 1 in. in diameter; diameter over casing, 1⅛ in.; maximum speed, 1750 r.p.m.; power delivered, 2 hp. at 400 r.p.m.; will operate grinding wheels up to 10 x 1½ inches.

is claimed that in shafts of this type the wear on the joints is reduced to the minimum.

Cherrying Attachment for Jackson Die-Sinking Machines

The illustration, Fig. 1, shows the type of cherrying attachment which is now being put on the No. 5 and No. 6 Jackson duplex typeless die-sinking machines. This redesign of the attachment has been adapted from a similar attachment which was first brought out for the No. 10 machine by the Jackson Machine Tool Co., Jackson, Mich.

Fig. 2 shows the interior of the housing of this at-

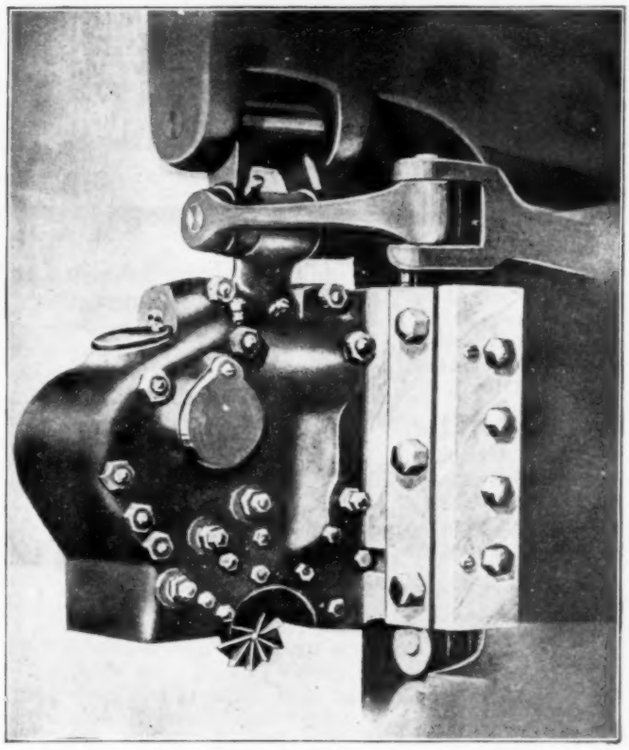


FIG. 1. CHERRYING ATTACHMENT FOR JACKSON MACHINES

tachment which is made with a circular guide in which the toolholder oscillates with a motion which has the center of the cutting tool as its center. This rotary oscillating motion is provided by means of a connecting-rod attached to the lug on the upper side of the toolholder.

The tool housing has a small movement so timed

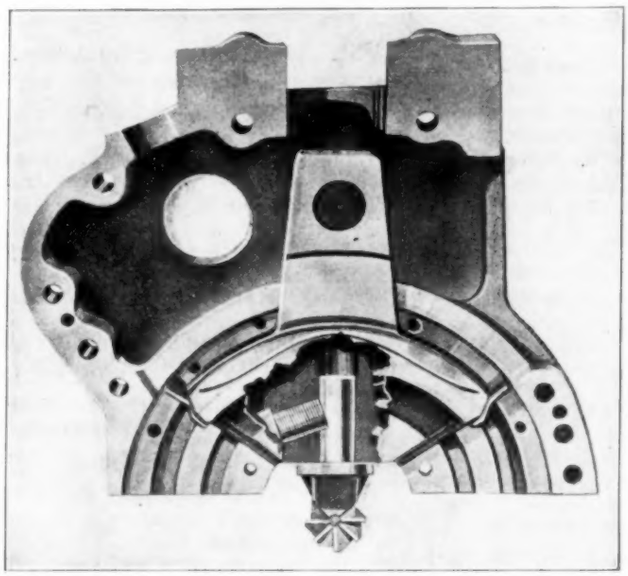


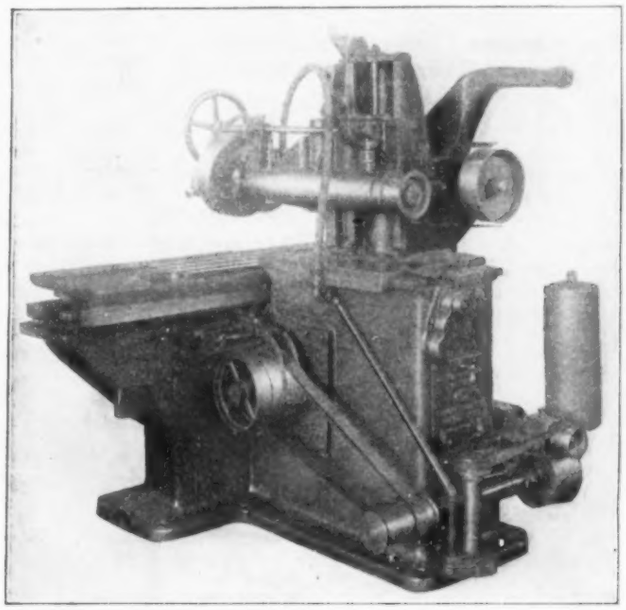
FIG. 2. INTERIOR CONSTRUCTION OF CHERRYING ATTACHMENT

that the cutter is lifted from the cut on its return stroke and again lowered on the cutting stroke. Ample bearing ways and take-up gibs insure it against wearing loose.

Improved Diamond Surface Grinding Machine

The Diamond Machine Co., Providence, R. I., has lately improved its automatic surface-grinding machine as shown in the illustration herewith.

One improvement is in the elimination of one motor. In the older type of machine separate motors were used



IMPROVED DIAMOND SURFACE GRINDING MACHINE

for the spindle and table drives while in the improved type but one motor of 3 hp. is used for both purposes. Power is transmitted to the spindle by chain and belt drive, and to the table by chain drive through worm gearing and a belt.

The second improvement is in the method of hanging the counterweight. By use of the overhanging arm shown in the illustration, the cable for the counterweight is kept free from contact with any part of the machine, thus preventing wear and assuring its free movement.

Putting the Back Gears in Front

BY CHARLES F. WHYTE

Every once in a while someone trots out the old trick of boring (or threading, or some other operation) on the back side of the lathe; a practice often resorted to by the writer.

Now will some one tell me why the "back gears" should not be on the front side instead of at the back, and so reverse the direction of thrust of the driving pinion?

As the gears are located in contemporary design the action of the tool tends to lift the work while the pinion does its best to lift the lathe spindle and between the two the work commences an up-and-down movement, limited only by the amount of play in the bearings, resulting in a chattered job.

Reversing the direction of rotation and cutting on the back side often gets away with an awkward job, but if designers had an eye to holding revolving parts steadily to one side, machines would often do more and heavier work than at present.

Sparks from the World's

By E. C. Porter.

Negotiations Under Way for the Export of Railroad Equipment

Negotiations are being conducted by the War Department with France, Poland, Czechoslovakia, and the Kingdom of the Serbs, Croats and Slovenes, for the sale of large quantities of railroad equipment and such other material as may be available for export. It is quite probable that these negotiations will be concluded in the near future and the sale effected of practically everything for which a ready domestic market does not exist.

F. M. Feiker Becomes Vice President of McGraw-Hill Co., Inc.

Frederick M. Feiker, formerly editorial director of the McGraw-Hill papers, has been elected vice president in charge of editorial matters.

A little over four years ago Mr. Feiker joined the McGraw organization as editor of the *Electrical World*, coming from Chicago, where for three years he had been chairman of the editorial board of all the publications of the A. W. Shaw Company, among them being the magazines *System* and *Factory*.

The new vice president of the McGraw-Hill Co. was born at Northampton, Mass., in 1881, and in 1904 was graduated from the Worcester (Mass.) Polytechnic Institute in electrical engineering. After special research work in the field of high-tension transmission with Prof. H. B. Smith, he served from 1906 to 1907 as technical journalist with the General Electric Co. While in that work, which brought him intimately in touch with the trade and business publications of the country, he conceived the idea of a management paper devoted to all phases of manufacturing. His forward thinking in this connection resulted in his going to Chicago in 1907 as a member of the staff of *System*. Shortly afterward this idea of his became concrete in *Factory*, a magazine of management, of which he became managing editor. In 1912 he became chairman of the board of editors of all the A. W. Shaw publications.

With his early training in electrical engineering and his later experience in the field of selling and production economics as a background, Mr. Feiker, on returning to the electrical field in 1915 as editor of the *Electrical World*, quickly sensed the pressing character of the commercial problems to be solved by the electrical industry and with characteristic vision and insight at once pointed out that the greatest development of the manufacturing and central-station groups could come only with the establishment of sound business principles and harmonious relations in the trade and distributing branches.

Mr. Feiker is a constructive thinker, with a resourcefulness of commonsense ideas that amazes even his associates who know him best. He has never been content in his editorial work to be a looker on but has gone down

F. M. FEIKER

into the industry and there rubbed elbows with other leaders on committees in various electrical associations. No small share of the constructive thinking of the electric vehicle section of the National Electric Light Association in the past four years has been his. He is this year chairman of the New York Section of the Illuminating Engineering Society. He is also a member of the other principal engineering societies.

At the annual meeting of the editorial conference of the New York Business Publishers' Association, Inc., held at the Automobile Club on Jan. 13, Mr. Feiker was elected chairman of the conference for the ensuing year. His three years' service as secretary-treasurer of this organization eminently fits him for the new office.

Wickwire Steel Absorbed

The Clinton-Wright Wire Co., a recent consolidation of a number of independent wire concerns, has acquired the Wickwire Steel Co., Buffalo. The merged company will be known as the Wickwire-Spencer Steel Corporation.

Ohio and Michigan Schools Lead in Filing Questionnaires

Ohio and Michigan educational institutions are leading the institutions of other states in filing questionnaires with the War Department as the first step toward obtaining the surplus machine tools which are to be sold under the Caldwell Bill. The Ohio and Michigan schools that have filed questionnaires will have first choice of the machine tools to be sold them by the War Department at 15 per cent of their original cost to the Government. Coupons entitling the institutions to obtain machine tools will be issued in the sequence of filing questionnaires. The last schools to fulfill the requirements of the War Department, as a result, will obtain their orders from the stock left by those who took advantage of the offer first.

The Director of Sales will pass upon the eligibility of institutions applying for tools. Those qualifying will be issued coupons for the number of machines allotted to them, each coupon being good for the purchase of one machine. Eligible institutions will be furnished from time to time by the various bureaus having surplus machine tools descriptive bulletins of such equipment from which selection may be made.

Ball Bearings in Steamship Engines

The Swedish ball-bearing manufacturers, after introducing ball bearings in rolling stock on the state railways, are now going to introduce the ball-bearing principle in ship construction, in connection with propeller shafting, according to a report from Consul Walter H. Sholes, at Coteborg, Sweden. The problem completes the construction of a bearing able to withstand all axial pressure from the propeller and excluding all possibilities of hot-box troubles.

The World's Largest Sale of Commercial Airplanes

What is said to be the world's largest sale of commercial airplanes was made at the Aëronautical Show, Chicago, Ill., Jan. 12. One company sold 440 planes to B. L. Brookins, Tulsa, Okla., for $2,500,000. It is stated that airplanes are now in great demand in oil fields as operators are using them to reach new fields when an oil strike is made. The directors of the show estimated that 1,700 planes were sold during the week of the show.

Industrial Forge

News Editor

Disposal of Surplus Road-Making Equipment

Practically all road-making equipment which has been declared surplus by the War Department here is being transferred to the Department of Agriculture. That department has been unable to obtain sufficient quantities of this class of material in the United States and was forced to secure the return from France of a large part of the equipment which was surplus there.

A New Industrial City

A new industrial city which promises to combine not only the latest ideas in factory construction and machine equipment but also the most modern ideas on housing accommodations, and the welfare of its people, is Marysville, Mich., just below Port Huron on the St. Clair River. This is the site of the new plant of the Wills-Lee Co., which is to build a new automobile, and such allied interests as the Pressed Metals Co., Ltd., Detroit Edison Co., Detroit Aluminum and Brass Co., Detroit Gear and Machine Co. and others. Some of these plants are already under construction.

Marysville will be unique in many respects. It has been planned to the smallest detail, including residence districts, manufacturing areas, retail business section, parks, playgrounds, streets and boulevards. It is probably the only city that is designed, just as a building is designed, for generations to come.

Messrs. Wills and Lee state that there are two principles upon which the town of Marysville is founded and is being built; the first is good, honest, well-paid work; the second is good, wholesome, clean, and contented living. They want Marysville to realize the highest ideals of American industry, to be a city of the best workmanship, the best citizens, and the most contented and prosperous American families. Everybody in Marysville is going to be busy. But everybody is also to have the surroundings, the opportunity, the time and the reason to be happy.

Houses of various sizes are being built and will be sold at low prices and on easy terms. Community houses or bachelors' quarters are being built on an entirely different plan than the usual "bunk" house. The rooms are of good size, well furnished in an attractive manner, and every effort will be made to provide a home atmosphere. It is not the desire to attract men from the large industrial centers, but from the smaller towns. Provisions are being made for the growth of the Wills-Lee Co. to a point where it can employ 60,000 people, which gives some idea of the future of Marysville.

New President of the Johnson Bronze Company

At a meeting of the board of directors of the Johnson Bronze Co., New Castle, Pa., last November, P. J. Flaherty was elected president of the

P. J. FLAHERTY

company to fill the vacancy created by the death of G. W. Johnson.

Mr. Flaherty organized the Johnson Bronze Co. and in reality has been the executive head of the firm since January, 1909, at which time this company was known as the American Car and Ship Hardware Company.

Government Gets $4,990,692 for Surplus Machine Tools

The surplus machine tools which have been disposed of by the Government up to the end of 1919 brought in $4,990,692. The original cost to the Government of those tools was $5,245,568.30. Other types of machinery and engineering equipment sold as surplus property brought in $4,535,910. The original cost of that equipment was $7,679,494.

Banking Corporation in Spain Buys Surplus Automobile Tires

All the automobile tires of millimeter size which were declared surplus by the War Department have been sold to a banking corporation in Spain, and are in process of delivery. One million yards of meltons have been sold to Greece and delivery is being arranged.

The 1920 New York Automobile Show

The great growth of the automobile industry is reflected in the ever-increasing exhibits at the New York Annual Automobile Show, and this also gives us a good idea of the extent to which the automobile-accessory business has grown. In spite of the growth of a number of the large companies, new automobile builders and assemblers seem to be coming into the field with considerable rapidity. In most cases the assemblers are using motors and other parts which are more or less well known and generally employing what might almost be called standard body lines. Even some of the older and well-known cars have dropped almost every trace of their distinctive appearance and have become standardized so far as lines and general fittings go.

Although the present year will see at least two new eight-cylinder cars, there seems to be a tendency back toward the six-cylinder motor; while in a few cases firms which formerly used sixes are now using fours. Many believe that this is the trend and that motors with more than six cylinders are likely to be the exception in a few years. One of the tendencies is toward accessibility of motor fittings, such as carburetor, magneto, pump and other parts. The vacuum feed enables the carburetor to be placed high on the cylinder block, making adjustment and repair much less difficult. There are, however, many points yet to be redesigned with a view to easy repair and replacement—notably the speedometer driving gear, which is on the propeller-shaft end of the transmission. In almost every car this is a solid gear which cannot be replaced without taking down the propeller shaft and in some cases the transmission itself.

A new valve motion is shown on one of the light sixes, in which the valves are set at a slight angle and the throw of the cams increased by levers which act as valve lifters. The placing of the valves on an angle is also done by a builder of an eight-cylinder motor, the theory being that the gas flows more readily around the valve than when these are parallel with the cylinder bore.

There are practically no changes in transmissions in spite of the acknowledged need for a more flexible method of transmitting power from the motor to the rear axle. The electric gear shift appears in a more convenient form but does not add to the flexibility, while the magnetic drive seems to have undergone no changes.

The locking, positive or nonskidding differential, by whatever name it may be called, seems to be making slow headway in spite of its apparent advantages, especially in the passenger-car field. Some truck makers are using it as standard equipment and reporting good results.

The use of aluminum pistons seems to be growing, although not as rapidly as expected by some of its advocates. There are, however, eighteen passenger cars so equipped, and drop-forged aluminum connecting rods are not only being talked of but are exhibited by at least two different makers of aluminum alloys. One of the somewhat surprising uses of aluminum is for cylinder-block castings on a truck and tractor engine, cast-iron liners being used in the cylinder bore. This is in line with a marked tendency to eliminate excessive waste in truck construction as well as in passenger-car motors. Along this line several experiments are being made with aluminum castings for rear-axle housings and for wheels for trucks and large motor buses.

The proportion of closed cars to open-body models is steadily increasing, and some makers expect to produce at least 40 per cent of this year's cars in closed bodies. The contest between magneto and battery ignition still goes merrily on, with the numbers favoring battery, although the old magneto has many staunch friends. A somewhat similar contest is being waged in the case of wheels, the steel disk wheel seemingly making greater headway than the wire wheel, which a few years ago seemed destined to be much more widely used than it is at present. In one instance a disk wheel is made of ⅛-in. saw steel so as to give flexibility as well as lightness.

Steam cars are still confined to the Stanley, which always attracts an interested crowd. The air-cooled motor was represented by two concerns with somewhat similar motors, although the newer car has worked out some of the details in a different manner.

Sale of Steel at Dodge Brothers' Detroit Plant No. 3

The Director of Sales announces that the Ordnance Salvage Board through the Detroit District Ordnance Office is offering for sale by negotiation approximately 980,000 lb. of steel, located at Dodge Brothers' Plant No. 3, Detroit, bids for which are now being invited by the District Ordnance Office.

Included in this lot of material is flat, round, square and hexagon cold-rolled stock; flat, round and square machine steel; round and flat screw stock; hot rolled rounds, and round forging steel in various sizes.

Offers for this material or any part of it will be accepted by the Detroit District Ordnance Office by letter or telegram. Further information, together with a complete description of the steel offered for sale, may be obtained from the Detroit office.

George R. Cullingworth

George Rhodes Cullingworth, vice president of the Garvin Machine Co., died at his residence in New York City on Dec. 15, 1919. Mr. Cullingworth was born on Aug. 24, 1837, in Manayunk, Pa., which at that time was a suburb of Philadelphia. He attended public school there until he was about sixteen years of age when he entered his father's machine shop to serve his

GEORGE R. CULLINGWORTH

apprenticeship. In 1857 he worked as a journeyman for Bement & Dougherty (now the Bement works of the Niles-Bement-Pond Co.) and continued there until 1859, when he went to work at Colt's Armory, Hartford, Conn. He afterward was employed as a toolmaker at the Star Armory, Yonkers, N. Y. From Yonkers he went to Trenton, N. J., and took a contract for making guns. In 1865 he was foreman for E. E. Garvin & Co., New York. Leaving there in 1887 he entered business as a member of the firm of Sargent & Cullingworth, New York. Here he did pioneer work in the manufacture of air compressors and rock drills. He also did some work in connection with the erection of the elevated railroads in that city and was the inventor of the well-known ticket chopper which is still in use. Later the Ingersoll-Sargent Co. (Now the Ingersoll-Rand Co.) bought his interest in the business. When E. E. Garvin died, Mr. Cullingworth was made a trustee of his estate and this bringing him in close touch with the Garvin Machine Co. (successor to E. E. Garvin & Co.) he entered its employ and was in charge of much of the experimental and special work.

A thorough mechanic and possessor of a genial disposition, Mr. Cullingworth was greatly beloved by all who knew him. He was a member of the American Society of Mechanical Engineers and vice-president of the Garvin Machine Co.

Revalidating American Trade-Marks in Germany*

By F. H. Williams

Vice President Trade-Mark Title Company

This article, which is based on special cable despatches, includes an illuminating and timely discussion of the entire domestic and foreign trade-mark situation, of immediate interest to every concern which has or thinks it has a property right in a mark or trade name.

Under a recently outlined course, the German commissars have indicated that the taking over of American trade-marks in Germany was only the result of a compulsory administration; and that in order to give absolute protection to American trade-marks in the future and remove any doubt of their legality, the present German Government is willing to accept registrations for American trade-marks at this time to the end of revalidating and registering the same.

This indication assures American manufacturers interested in a desire to continue to do business in Germany and to protect their mark there, and all who formerly registered their mark in that country, an unusual opportunity; and business executives should give these matters immediate attention, that their board of directors may act and take advantage of the new situation at the next meeting.

It is to be regretted that in American business circles our busy executives do not give their trade-mark matters personal attention: it very seldom reaches the board of directors' meetings, as it should do. Trade-mark details have been passed to minor clerks, or clerks who have had an inkling of patent law, and more or less handled as a side issue to the patent features of large business interests when they deserve a much larger consideration. The result has been that until a concern saw its trade-mark in litigation, it deemed the matter of secondary importance. When once in litigation, and executives are compelled to sit in a court room for days or weeks and listen to testimony concerning a trade-mark, hear the argument of counsel, and the importance of their situation, then alone are they awakened to what a trade-mark really is. Whereas, had their trade-mark matters received the attention they really deserved within their business and advertising household, very few would see their marks in jeopardy. Instead of that, hundreds and hundreds of trade-mark owners are continually put on their inquiry to defend their marks from year to year, and go to endless expense in lawsuits, all of which could be avoided.

With the foreign trade-mark situations, business executives are daily signing at the request of patent attorneys blank powers of attorney, which are forwarded to all parts of the world. The practice has been part of a loose system concerning foreign registration of trade-marks for many years, and has caused an endless amount of trouble

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(*Continued on page 216b*)

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

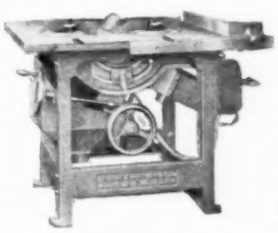
Wheels, Abrasive.
Wolf New Process Co., Meriden, Conn.
"American Machinist," Oct. 23, 1919

The Wolf New Process Abrasive Wheels is a new and secret process which produces a free cutting wheel at a low cost. Any desired abrasive may be used, the company's process concerning only the bond and the modifications of methods of handling made possible by it. Wheels may be made of any size or shape within the limits of present commercial standards.

Chest, Utility Tool.
Union Tool Chest Co., Inc., Rochester, N. Y.
"American Machinist," Oct. 30, 1919

The frame is constructed of kiln-dried oak with joints lock-cornered. The tray is built in the same manner and fitted with movable partitions. The top and bottom of the chest are rabbeted, nailed and glued. Inside dimensions (type L): Length, 15¼ in.; width, 7 in.; depth, 6⅞ in.; tray, 14½ by 4 in.; depth, 1½ in.; weight, all wood, 6 lb.; leather covered, 8 lb. Type LL is 18¼ in. long, other dimensions including tray being the same. Weights, 7 and 8 lb. each, respectively.

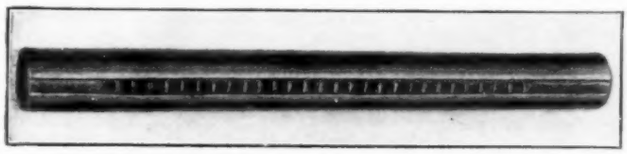
Saw Bench.
Baxter D. Whitney & Son, Inc., Winchendon, Mass.
"American Machinist," Oct. 30, 1919



Two motors, having a speed of 3450 r.p.m., are mounted on saw arbor. Motor housings are part of the yoke carrying saw arbor and the ball bearings, all of which are tilted as a single unit to the desired bevel cut of the saw, instead of the usual method of tilting the table. The method of mounting the motors eliminates all extra bearings. By the movement of a handwheel the saw arbor can be tilted to saw at any desired angle up to 15 deg. The motors can be started and stopped by inclosed switch mounted on the machine.

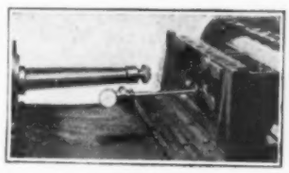
Cutters, Push Keyway, Velco.
V. E. La Pointe Manufacturing Co., Manchester, Conn.
"American Machinist," Oct. 30, 1919

Are intended for use in an arbor press or similar machine although they can be driven through the holes with a soft hammer. One pass through a hole finishes the keyway. The bodies are the same size as the holes in which the keyways are to be



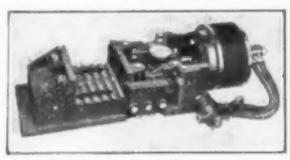
broached and the cutters are for standard keyways. At present these tools are made in sizes ranging from ½ to 1 in., varying by 16ths. The cutter blades are interchangeable and, when worn or broken, may be replaced with new ones. The blades can be furnished with straight teeth or with "Velco" staggered teeth.

Gage, Cylinder Testing.
Federal Products Corp., 393 Harris Ave., Providence, R. I.
"American Machinist," Oct. 30, 1919



Designed to detect slightest variation in the bore of cylinder and to operate in vertical or horizontal position; centralizing support operated by handwheel holds apparatus in position and permits device, including the dial, to turn freely, in either direction. Dial is graduated in thousandths of an inch; hand is operated by a steel rod actuating rack and pinion. A small lever is used to depress the feelers when inserting them into the cylinder, after which, by releasing the lever, feelers are automatically released against the walls of the cylinder.

Vise, M. E. C. Air-Operated, Machine.
Manufacturers Equipment Co., Waller and Filmore Sts., Chicago, Ill.
"American Machinist," Oct. 30, 1919.

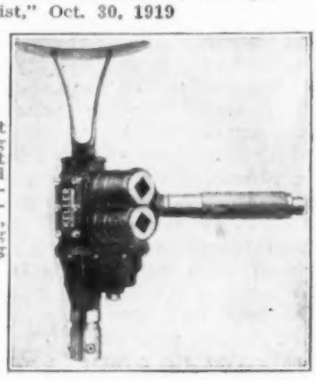


Serves the same purpose for milling and drilling machines that the air-operated chuck serves for a lathe. Not intended for universal use, but is best adapted for handling large numbers of pieces on a production or manufacturing basis. The movable jaw has a power stroke of ¼ in. and is double acting, being controlled by a small lever valve. The cylinder used is either 6 or 8 in. in diameter, designed for 80 lb. per square inch. Length over all, 28 in.; width, 12 in.; height to top of jaw, 6⅜ in.; size of jaw, 8 in. by 3½ in.; capacity, between jaws, 6 in.; total weight, 225 pounds.

Screwdriver, Power.
H. Hollingshead, 55 Liberty St., N. Y.
"American Machinist," Oct. 30, 1919

Screw or drill driver. The motor will run on either alternating or direct current of 110 to 120 volts. The drive from the motor to the spindle is through worm gearing provided with ball bearings. The spindle can be started and stopped at will by means of a clutch; can be used as a hand wrench so that a tight screw or nut can be started by hand before turning on the power. The machine weighs 14 lb.; the body is 4 in. in diameter and 10 in. long. The motor is 3 to 5 hp.

Drill, Air, Keller Master Valveless.
Keller Pneumatic Tool Co., 20 E. Jackson Blvd., Chicago, Ill.
"American Machinist," Oct. 30, 1919



Drill is light weight, compact and consists of four single-acting pistons arranged in pairs at right angles, each pair being connected to opposite wrists of the crankshaft. These drills are built in non-reversible and reversible types, including a reversible wood-boring machine and a reversible grinding machine.

to many American manufacturers. The abuse of these powers of attorney has occured, not in a few instances, but in hundreds, in almost every country of the world.

Another interesting situation taking place with regard to foreign registrations as a result of these powers of attorney has been the filing in several countries of documents that do not meet the requirements of the laws of the respective countries. It has been the rule with many to file any kind of document in order to secure the registration of the mark. In many countries the laws call for the filing of a certified copy of the United States Trade-Mark Registration. This has not been done, and other documents have been filed in lieu of same. Should the time ever arrive when any of these trade-marks, registered in this way, come into question and they reach the stage of a lawsuit, these very points will throw the trade-mark registration out in favor of a third party, and thus invalidate the whole registration, perhaps not alone in one country but in many countries.

The foregoing situation is mentioned because Germany was one of those countries that heretofore required a United States Trade-Mark Registration, and proceedings along the line indicated were often taken where it was impossible to secure a United States Registration to overcome these points.

Under the new situation regarding trade-marks, these former objections can now be overcome legally where a United States Registration cannot be secured and those who are familiar with these new regulations will have no trouble in filing the necessary and proper specifications to secure the registration of their American trade-marks.

Trade-mark rights in Germany will continue to remain property rights in the Republic of Germany, just as they remain property rights in the several states of the United States.

There is no such thing as a "common law right" in trade-marks in Germany, and even here in the United States the so-called common law right in a trade-mark is a very much misquoted term, as expressed in encyclopedias and other reference works.

Common law rights in trade-marks in countries that recognize common law exist only where there are no statutory laws upon the subject. In view of recent court decisions in the United States on trade-marks, there is not much left to the idea of a common law right in trade-marks in this country.

Because of the foregoing stituation, trade-mark "gorillas" have made their appearance within our own gates, and daily American trade-marks are being grasped right at our doors by unethical legalized stealings.

Correct protection of trade-marks, and litigation concerning trade-marks is of such unusual character that it becomes a specialized law practice, not alone in the United States, but in nearly all foreign countries. It can hardly be said that the average patent attorney is fully competent to handle trade-mark matters; the best proof of this is that the majority of patent attorneys are not admitted to practice law. When it comes to a litigated case they usually employ counsel and simply sit in the case themselves in an advisory capacity. The net result of this has been that upon reaching the court room the average American client was surprised to be introduced to new counsel in his trade-mark litigation.

Considerable litigation over trade-marks has reached the courts as a result of American manufacturers believing that they were properly registered with some government department either in this country or in some foreign country, whereas as a matter of fact all that had been done was to register their trade-mark with some private registration trade-mark bureau. Thousands of American trade-marks today are relying upon this sort of trade-mark registration for their protection: a registration that is worthless, and usually made under false pretenses in connection with some alleged vigilance service.

Thousands of these American marks are likewise recorded with private foreign registration bureaus.

One would not record his deed to a piece of real estate in any other office than with the county clerk or the registrar of deeds, or the proper official receiving such documents for record. Likewise, one should secure his property rights in his trade-marks along the same line, through proper, recorded official sources. Laws afford this protection and record in every country in the world, and all that is necessary for the American manufacturer is to seek correct service.

The expenditure of a few thousand dollars for correct world-wide service is better than later expending thousands of dollars for the taking of testimony and the trial of a lawsuit. The burden is on the American manufacturer to seek every avenue of protection. If he does not do this, that is his fault; he must sooner or later pay the penalty.

The law of no country concerns itself with the motives of men when their acts are lawful. This is true in the United States and in foreign countries. Nor do the courts concern themselves with the injuries that result from the exercise of lawful rights and privileges, and this is true where the aggrieved party had the opportunity to take advantage of the laws of property in trade-marks but neglected to do so.

It might be of interest to know that no trade-mark rights have been sold by the German trustees under their compulsory administration.

There is serious doubt as to whether the American Alien Property Custodian ever acquired a property right in any United States Trade-Mark Registration or even the property itself of the alleged German enemy whose property was confiscated. These trade-marks were confiscated as if such property right existed. No one has ever secured a property right in a trade-mark through a United States Patent Office registration; all that has been secured has been a certificate of registration showing that through the statement of the applicant, and as a result of a certain examination and procedure in the Patent Office, the trade-mark has been allowed to become registered, and from that act it has what might be prima facie evidence of title to the trade-mark. The same is always in a situation where it may become void through a court action.

That considerable doubt on the part of the Alien Property Custodian existed as to his right to dispose of these trade-marks is evidenced by the fact that whenever any assignment of a trade-mark was made it carried with it the following clause:

"It is expressly provided, however, that this sale is made without recourse of any kind, or by any one, upon the undersigned as Alien Property Custodian, or upon any successor in office or the undersigned, or any agents, liquidators, or employees of the undersigned, as Alien Property Custodian or his successor in office, and is accepted subject to such condition."

The next few years will witness an endless number of lawsuits in the courts of the United States and foreign countries regarding trade-mark situations that have arisen as a result of the conditions due to the war. A number of very interesting questions will be brought out.

Hundreds of the German trade-marks sold by the American Alien Property Custodian will become involved, with millions of dollars being spent in litigation, and every American purchaser of these trade-marks should now take every precaution to anticipate these lawsuits and protect themselves from every angle.

A leading trade-mark, on which millions of dollars have been expended in the United States and Canada, was confiscated by the American Alien Enemy Custodian. It was duly sold to Americans here in New York, and the title shows the corporation to be a New York corporation composed of American citizens. As a matter of fact, documents are on file in Canada showing these same persons to be subjects of Germany. If they are Americans, their case, handled by a leading patent attorney in Canada, is being very poorly handled: because if the court documents in Canada allege true facts (under the Act of Congress Approved Mar. 28, 1918, it is provided that

"Any property sold under this Act, except when sold to the United States, shall be sold only to American citizens. . . . Any person purchasing property from the Alien Property Custodian for an undisclosed principal, or for resale to a person not a citizen of the United States, or for the benefit of a person not a citizen of the United States, shall be guilty of a misdemeanor and upon conviction shall be subject to a fine of not more than ten thousand dollars or imprisonment for not more than ten years, or both, and the property shall be forfeited to the United States.")

These people have placed themselves in jeopardy in Canada.

In the same lawsuit the documents

(*Continued on page* 216*d*)

Condensed-Clipping Index of Equipment

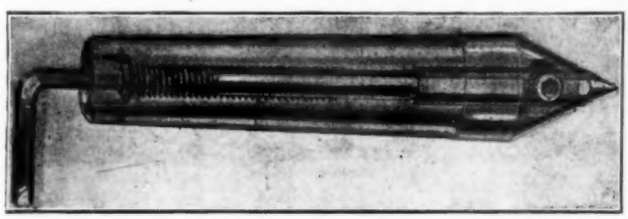
Patented Aug. 20, 1918

Quenching Compounds, for Steel.
Wheelock, Lovejoy & Co., Cambridge, Mass.
"American Machinist," Oct. 30, 1919

Are known as Quenchoid and Feusalt, the former being used for carbon and the latter for high-speed steel. Are used at a temperature of approximately 300 deg. F., and, in spite of this temperature, seem to secure the desired hardness without increasing the heat of the steel beyond the usual point. Temperature at which they are used greatly reduced the shock to the piece being heat-hardened, and in this way greatly lessens the tendency to crack.

Center, Lathe with Adjustable Point.
Robinson Adjustable Center Co., Detroit, Mich.
"American Machinist," Oct. 30, 1919

A lathe center with an adjustable point. The body of the center is made of carbonized steel while the point is of high-



speed steel, hardened and drawn enough to relieve the strain from hardening. The point is interchangeable and can be adjusted for length and clamped by means of the safety setscrews as shown.

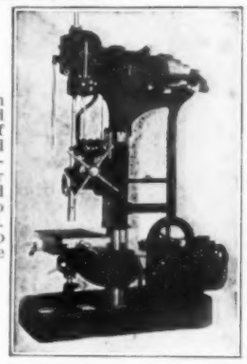
Press, Arbor M. E. C. Air.
Manufacturers Equipment Co., Waller and Filmore Sts., Chicago, Ill.
"American Machinist," Oct. 30, 1919

Made in two sizes, ram has lock collar to stop downstroke. Specifications (both sizes): Number of press, 11 in., 12 in.; maximum stroke, 6 in., 7 in.; maximum distance, top of base to ram, 15 in., 24 in.; minimum distance, top of base to ram, 9 in., 17 in.; cylinder bore, 6 in., 8 in.; capacity at 80 lb. per square inch, 6600 lb., 10,900 lb.

Sawing Machine for Cutting Rails.
Racine Tool and Machine Co., Racine, Wis.
"American Machinist," Oct. 30, 1919

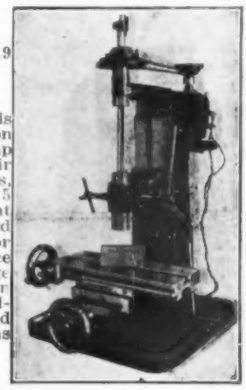
Complete with motor and starting box; frame and body are steel castings. Motor is interpole, ball bearing fully inclosed; will operate on direct current 260 to 600 volts. Current may be taken from trolley wire or third rail. Motor mounted on frame of the machine drive through worm gearing. Clamping devices allow the machine to be easily placed at work, and the clamps may be readily adjusted to cut any size of rail within the range of the machine. Machine will cut a 9-in. girder rail in from 15 to 18 min.; one blade will cut from 8 to 10 rails. Weight with motor and starting-box, 225 lb.; length of stroke, 6 in.; number of strokes per minute, 60; will cut rails up to 9 in.; time for cutting 9-in. rail, 15 to 18 min.; current, 260 to 600 volts.

Drilling Machine, Oil-Pan Base.
Weigel Machine Tool Co., Peru, Ind.
"American Machinist," Oct. 30, 1919



The pan which is cast integral with the base is 6 in. wide, 8 in. deep and rises 4 in. above the upper surface of the base. The coolant can be pumped from and returned to the reservoir without spattering on the floor. Bolts for holding down the machine are placed outside of the pan, so that there is no danger of leakage through the bolt holes. The 21-in. drilling machine can also be furnished with an oil pan of the above type.

Profiling Machine.
R. M. Clough, 327 Colony St., Meriden, Conn.
"American Machinist," Oct. 30, 1919



Spindle runs in ball bearings, and is driven by a ½-hp. motor mounted on column; motor can be connected to lamp socket. Drive is a round belt on a pair of cone pulleys, giving range of speeds, 500 to 3000 r.p.m. Spindle has No. 5 B. & S. taper hole. Vertical movement of 3 in. at sleeve head may be raised 12 in. Sleeve movement by hand lever or treadle. Table has movement across face of the column 12 in. and in-and-out range of 5 in. Micrometer dials provided on screws; table has micrometer stop. Adjustable stops, not graduated, provided for other movements. Machine weighs 300 pounds.

Vise, Milling Machine, Air-Operated.
Neidow & Payson Co., 9 South Clinton St., Chicago, Ill.
"American Machinist," Oct. 30, 1919

Specifications: Made in four sizes; cylinder diameters, 3 and 4 in.; jaw width, 4, 5, 6, 7½ in.; jaw height, 1⅞ in.; screw adjustment, 2, 3, 3½ and 4 in.; total opening, 2⅞, 3⅞, 4½ and 4⅞ inches. Piston works jaws through double toggle joint, giving great power and preventing releasing the work should air pressure go off the line. The body of vise is a steel casting; jaws faced with hardened-steel plates. All lever movements inclosed. Air valve mounted on the cylinder. Vise is made in four sizes with air cylinders of 3- and 4-in. diameters.

Goggles, All Purpose.
T. A. Willson & Co., Inc., Reading, Penn.
"American Machinist," Oct. 30, 1919

Aluminum-cup goggle that can be equipped with either plain glass or colored lenses and if desired to be dust-tight can be furnished without the ventilating perforations. The lenses are held by safety flanges which, in case of fracture, hold the pieces of glass together and prevent them from being driven into the eyes. Goggles of this type can be furnished in transparent cellulose instead of aluminum if desired; also with lenses of the regular chipper's grade, super-tough glass, laminated glass or triplex glass.

Clip, paste on 3 x 5-in. cards and file as desired

show an alleged assignment made in 1913, and only recorded in 1919. No court will look upon assignments thus recorded with the same notice as if it had been properly recorded in 1913. Belated assignments have caused the disbarment of many an attorney in the United States and meant serious consequences to the notary public who subscribed to the documents. Sometimes the examination of water marks on the typewriting paper has indicated in will contests the non-manufacture of the particular typewriting paper on the alleged date of the will. Not long ago in a will contest such a fact was proven by a secret water mark of the manufacturer on the paper. Such facts cannot be covered up, even though the transactions be handled by well-known law firms. Disbarments of even well-known lawyers have not been infrequent in recent years in the United States.

The Government of Canada is entirely separate from that of Great Britain, and trade-mark rights in Canada are property rights and are of course assignable in Canada. The Ministry of Justice in Canada ordered property rights of the enemy confiscated. It takes along with such action all trade-mark rights, and no assignment of such trade-marks can undo this action. Therefore it is doubtful if a belated assignment recorded after such action is good.

The result of this lawsuit in Canada is looked forward to with interest; and it can now be stated that the Canadian judges will examine every part of the transaction with the greatest care. Any one who has enjoyed the privilege of practicing before the Canadian courts will appreciate the high standing of its judges and their unwillingness to have something slipped over on them.

Trade Currents From New York, Cleveland, Chicago and Philadelphia

New York Letter

The first two weeks of 1920 closed with business booming along briskly in the New York machine-tool trade, delivery being the ruling factor affecting closures, and with several firms withdrawing from solicitation of business along certain lines in order to catch up with deliveries scheduled on 1919 orders. It is also reported that in several cases orders have been booked solid for the entire year for certain kinds of machine tools.

A leading machine-tool firm is the authority for the statement, through its president, that the business for the first ten working days of 1920 is far ahead of that returned in any similar period in the history of the local companies. With this as a criterion, it looks like a big year ahead.

While there are no large sales, these are compensated for by a large volume of small group and single item orders for a wide range of equipment. It is this class of business that occupies the boards at present, but large orders, due to numerous expansion and replacement programs now under advisement among local industries, may be expected within a reasonably short time.

Quite a number of Mid-Western firms were inquirers in the local market during the week past.

Replacements are contributing substantially to machine-tool sales. One firm reports that most of its business for a week past has been for replacement items, and from present indications this class of business will continue heavy for some time. Robert Gair & Co., of Brooklyn, is doing a great deal of replacement, but, for the time being, is out of the market for any more new equipment.

Trading in used machine tools continues brisk with little apparent change. There is some tendency on the part of buyers of this class of equipment to look askance upon offerings salved from Government operations as a great deal of it is not adapted to peace-time usage without extensive, and sometimes costly, alterations. There is a large amount of used machinery on the market that was designed for special use on classes of work that were met with only in munition making. There is very little demand for this equipment.

The export market for machine tools is still adversely affected by the low exchange rates prevailing with Continental countries, but this situation is not apparent in the Far Eastern and South American fields. Inquiries continue steady with many really good opportunities offered.

Everything considered, the machine-tool situation in and around New York City is satisfactory, with most of the companies doing a capacity business, and in many instances turning it away. It looks like a record year for the local dealers.

Cleveland Letter

A marked change in machinery-market conditions in the districts served by the Cleveland machine-tool trade is noted in the last ten days. Continued stock taking by some of the largest users gives the market a hesitant tone, but, generally, consumers are again following up their inquiries with orders.

Much of the new business is placed contingent on immediate delivery. Many buyers specify periodic deliveries over the year based on present prices, with some deliveries scheduled as far back as September. It is believed that apprehension on the part of machine-tool buyers of prices increasing rather than remaining stable or decreasing is responsible for delayed delivery requests.

Orders for standard equipment prevail, with but little demand showing for special and "tailor-made" machinery.

Unstable prices for the first two weeks of 1920 have been interpreted as an indication of coming shortages in equipment for the last half of the year. Thus, the tendency of buyers is to order now for delivery later, and be sure of having their equipment when it is needed.

The outstanding feature for the immediate future, in the opinion of the Cleveland trade, is the trend that industry will take with the return of railroads to private ownership March 1, as planned at Washington. The attitude of labor generally with this change will have much to do with future progress. It is felt that if labor is prone to make sensational demands, industry will be affected, while if the present attitude is maintained, a rush of business exceeding even that of 1919 will be seen during the last half of 1920.

Chicago Letter

A peaceful and prosperous world makes little news. As peace and prosperity reign in the machine-tool industry in the Chicago district, there is but little of interest to report. All dealers report an excellent volume of business, both in current sales and in delivery of tools ordered at some time in the past. So far as buying is concerned, conditions of the past few months continue. A feeling that some higher prices may be anticipated in the near future is felt throughout the trade, and this feeling is undoubtedly stimulating purchasers to some extent.

Railroad inquiries have not developed any sales of moment. In this connection there are two divergent opinions. One is that, immediately before Mar. 1—the date set for returning the roads to private ownership—material numbers of tools will be bought by the Railroad Administration in an effort to return the roads in their original condition. The other is that no buying will be done by the Government, but that immediately after the owners resume control they will buy to bring their shops up to that state of efficiency which active competition will require. One guess is as good as another. The evident fact is that very soon a great deal of machinery will have to be bought by the various railroad interests.

Philadelphia Letter

Business continues steady in the local machine-tool market, with orders contingent largely upon delivery. There is a substantial increase in the volume of business reported for the last two weeks over the corresponding period in December, with a predominating demand for lathes and milling machines.

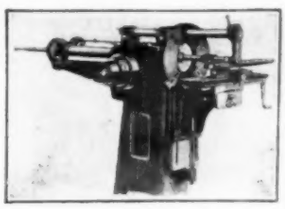
Woodworking machinery has taken a prominent place on the inquiry lists released lately due to the establishment of several new furniture factories, and expansions by the numerous firms in the Philadelphia district who specialize in wood products.

The delivery situation is still unsatisfactory, and at this writing is without change, or signs of improvement. Floor stocks are disposed of rapidly, and it is a problem with most machine-tool dealers to keep any stock at all on hand for any length of time.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Multi-Purpose Machine, Kriesel.
Mill City Co., Plymouth Bldg., Minneapolis, Minn.
"American Machinist," Oct. 30, 1919

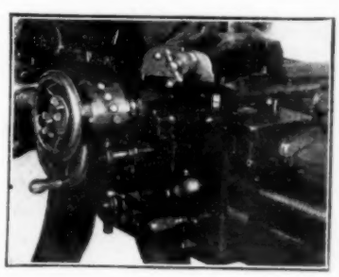


Combined boring, drilling and milling. Specifications: Boring depth, 16 in.; boring diameter, 2¾ x 7 in.; milling and drilling range, all hand feeds, vertical, 9 in.; cross, 4 in.; longitudinal, 13 in.; boring-bar diameter, 2⅛ in.; length, 38 in.; travel, 18 in.; spindle diameter, smallest point, 1⅞ in.; taper hole in spindle, Morse No. 3; floor space, 86 x 45 in.; height, 52¾ in.; domestic shipping weight, 1050 lb.; export shipping weight, 1100 lb.

Offset Center Head, Adjustable.
A. Verwys Tool Co., 629 Leonard St., N. E., Grand Rapids, Mich.
"American Machinist," Oct. 30, 1919

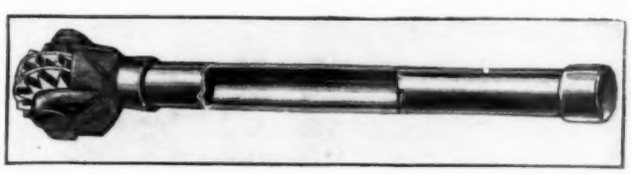
Can be used for laying out squares, hexagons, triangles, etc., on round work. It can also be used for laying out keyseats and the centers for turning crankshafts.

Stops, Crossfeed for Lathe.
R. K. Le Blond Machine Tool Co., Cincinnati, Ohio.
"American Machinist," Oct. 30, 1919



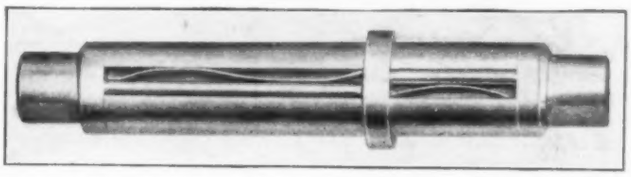
The stop collars are set up to suit the work and locked in postion by two thumb screws in the crossfeed handwheel. The crossfeed stops may be set within a range of from 0.001 in. to a full turn of the crossfeed screw. The crossfeed dial is extremely large in diameter so that the graduations may be easily read and in addition there are provided indicator clips which can be set at any position on the dial for quickly directing the eye to the selected graduations.

Dressing Tool, for Abrasive Wheels, "Yellow Head."
Hetherington Co., Piqua, Ohio.
"American Machinist," Oct. 30, 1919



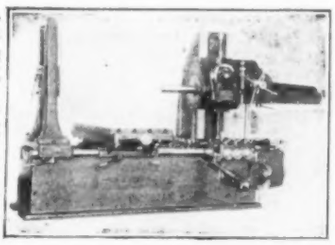
Has hollow handle, filled with dry graphite, for lubricating bearings. Cutters are fast on revolving shaft, has staggered teeth. Will remain in same position as set at the factory. Object of staggering the teeth is to form diagonal corrugations on the face of abrasive wheel to produce a fast-cutting surface with less liability to heat. Cutters are made of high-carbon steel and have long sharp teeth. Dressing tool is made in two grades: No. 1 for ordinary wheels up to 10 in. in diameter and No. 2 for hard wheels, 12 in. in diameter and over.

Mandrel, Efficiency, Self-Gripping.
Efficiency Tool Products Co., Bridgeport, Conn.
"American Machinist," Oct. 30, 1919



Mandrel has two sets of three equidistant grooves, inclined circumferentially at the bottoms. In each groove is a roller backed up by a flat steel spring. With work on the mandrel the pressure of the cut forces the rollers up the incline so that the greater the cut pressure, the tighter will be the grip.

Boring Machine, Horizontal, No. 45.
Giddings & Lewis Manufacturing Co., Fond Du Lac, Wis.
"American Machinist," Oct. 30, 1919



For standard machine: Diameter of spindle, 4½ in.; longitudinal travel of spindle, 35½ in.; vertical adjustment of head, 39½ in.; maximum distance from table to center of spindle, 40 in.; maximum distance from top of bed to center of spindle, 50 in.; face of spindle to boring-bar support, 84½ in.; size of table, 36 x 60 in.; cross travel of table, 44 in.; longitudinal travel of table, 48 in.; number of spindle speeds in each direction, 18; range of speeds, 5 to 160; number of feeds in all directions, 18; range of feeds, 0.004 in. to 0.874 in.; speed of driving pulley, 300 r.p.m.; size of driving pulley, 20 x 4½ in.; approximate net weight, standard machine, 22,000 lb.; duplex machine, 38,000 lb.

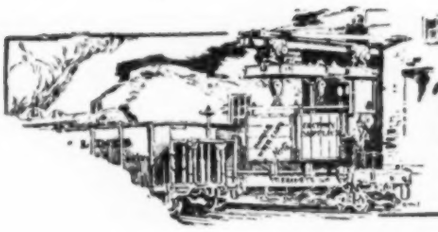
Mereti Process for Repairing Metals.
T. P. Walls Tool and Supply Co., Inc., 75-77 Walker St., New York.
"American Machinist," Oct. 30, 1919.

Mereti is a bonding metal for repairing cracks or breaks in aluminum, brass, copper or white metal, but is not suitable for steel or iron. It comes in small bars like solder, weighing from ¼ to ½ lb., but is used like plaster, no flux or soldering iron being required. The process is to clean the part to be repaired, the same as for soldering, and heat with a torch, after which the fracture is "tinned" with the metal. Some of it is next heated until it has the consistency of putty, when it is applied to the fracture with a steel scraper, such as is made from a small file. It is allowed to stand 10 min. or more until "freezing."

Goggles, Willson Welding.
T. A. Willson & Co., Inc., Reading, Penn.
"American Machinist," Oct. 30, 1919

Lenses are triangular or drop-eye in shape; of high-quality glass colored to afford protection against injurious light rays. They are covered with clear glass to protect the more expensive colored lenses from scratches or other injury. When there is not much danger from flying particles or splashes of molten metal the ventilation ports can be removed. Cups carrying the lenses are made of a material that is a nonconductor of heat and electricity and is not affected by moisture.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co., as per Department of Commerce Committee Schedule.

	Current	One Month Ago
CINCINNATI		
No. 2 Southern	$39.10	$36.60
Northern Basic	38.20	34.00
Southern Ohio No. 2	40.80	36.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	45.65	39.40
Southern No. 2 (Silicon 2.25 to 2.75)	43.20	41.40
BIRMINGHAM		
No. 2 Foundry	35.50	33.00
PHILADELPHIA		
Eastern Pennsylvania No. 2	42.50*	38.10
Virginia No. 2	40.00*	39.10
Basic	40.00†	34.60
Grey Forge	39.50*	34.60
CHICAGO		
No. 2 Foundry local	40.00	36.25
No. 2 Foundry, Southern	40.50	38.00
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	39.40	
Basic	36.40	34.40
Bessemer	37.40	35.40

* F. o. b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$3.47	$3.47	$4.27	$3.27–2.32	$4.17	$3.47	$4.27
Soft steel bars	3.52	3.52	4.17	3.52	4.17	3.52	4.17
Soft steel bar shapes	3.52	3.52	4.17	3.57–3.82	4.17	3.52	4.17
Soft steel bands	4.22	4.22	4.77				
Plates, ¼ to 1 in. thick	3.67	3.67	4.52	3.37-3.62	4.42	3.67	4.25

Note—For less than carload lots, add 4½c. per 100 lb.

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$3.50	$3.50
Warehouse, New York	3.52	4.75
Warehouse, Cleveland	3.42	4.67
Warehouse, Chicago	3.52	4.10

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

	Mill Carloads, Pittsburgh	New York		Cleveland	Chicago
		Current	One Year Ago		
No. 28 black	$4.35–4.85	$7.00–8.00	$6.52	$6.15	$6.00
No. 26 black	4.25–4.75	6.90–7.90	6.42	6.05	5.90
Nos. 22-24 black	4.20–4.71	6.85–7.85	6.37	6.00	5.85
Nos. 18-20 black	4.15–4.65	6.80–7.80	6.32	5.95	5.80
No. 16 blue annealed	3.75–4.20	5.27	5.72	5.55	5.02
No. 14 blue annealed	3.65–4.10	5.17	5.62	5.45	4.92
No. 10 blue annealed	3.55–4.00	5.07–6.00	5.52	5.35	4.82
No. 28 galvanized	5.70–6.20	7.75–9.00	7.77	7.50	7.25
No. 26 galvanized	5.40–5.90	7.45	7.47	7.40	6.95
No. 24 galvanized	5.25–5.75	7.30	7.32	6.95	6.52

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$5.00	$4.90	$5.00
Flats, square and hexagons, per 100 lb. base	5.50	5.40	

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$21.00–26.00	$19.00
Cleveland	20.00	20.00
Chicago	16.50	19.00

In coils an advance of 50c. usually is charged.
Domestic iron (Swedish analysis) is selling at 15c. per lb.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100 lb. lots and over:

Welding Wire		Cast-Iron Welding Rods	
3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 9/32, 5/16, No. 8, 3/8 and No. 10	21.00 to 30.00	5/16 by 12 in. long	14.00
		5/16 by 19 in. long	12.00
		1/2 by 19 in. long	10.00
No. 12		1/2 by 21 in. long	10.00
7/16, No. 14 and 1/2		Special Welding Wire, Coated	
No. 18		1/8	33.00
No. 20		5/32	30.00
		3/16	38.00

Domestic 20c. for 1/16, 15c. for 1/8 to 3/16

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	6.00	8.00	8.00
Spring steel (light)	8.00	10.00	11.00
Coppered bessemer rods	8.00	8.00	6.75
Hoop steel	4.47	4.75	4.32
Cold-rolled strip steel	8.40	8.25	8.00
Floor plates	6.30	6.00	6.27

Note—For less than carload lots, add 4½c. per 100 lb.

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of National Tube Co. for steel pipe, Cardry A. M. Byer's Co. for iron, both dated Mar. 21, 1919.

BUTT WELD

Steel Inches	Black	Galvanized	Iron Inches	Black	Galvanized
1/8, 1/4 and 3/8	50½%	24%	1/8 to 1¼	30%	23½%
1/2	54½%	40%			
3/4 to 3	57½%	44%			

LAP WELD

2	50½%	35%	2	32½%	18½%
2½ to 6	53½%	41%	2½ to 6	34½%	21½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

1/8, 1/4 and 3/8	46½%	29%	1/8 to 1/2	39½%	24½%
1/2	51½%	39%			
3/4 to 1¼	55½%	43%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	48½%	37%	2	33½%	20½%
2½ to 4	51½%	40%	2½ to 4	.....	23½%
4½ to 6	50½%	39%	4½ to 6	34½%	22½%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
⅛ to 3 in. steel butt welded	47%	31%	43½%	34½%	57½%	44%
2½ to 6 in. steel lap welded	42%	27%	45½%	39½%	53½%	41%

Malleable fittings. Class B and C, banded, from New York stock sell at plus 18%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	19.50	20.00	26.00
Tin in 5-ton lots	62.75	53.87½	72.00
Lead	8.75	6.80	7.05
Spelter	9.55	8.30	8.60
ST. LOUIS			
Lead	8.37½	6.55	6.75
Spelter	9.22½	7.95	8.25

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

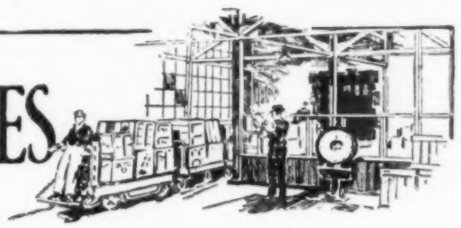
	New York			Cleveland		Chicago	
	Current	Month Ago	Year Ago	Current	Year Ago	Current	Year Ago
Copper sheets, base	29.00	33.50	38.00	31@32	38.00	36.00	38.00
Copper wire (carload lots)	28.25	29.00	35.00	29.50	35.00	27.00	38.00
Brass sheets	25.50	32.00	39.75	29.00	30.50	27.00	38.00
Brass pipe	32.00	36.00	46.00	34.00	42.50	35.00	44.00
Solder (half and half) (case lots)	35.00	45.00	55.00	40.50	47.50	38.00	65.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	23.75	36.00
New York	23.75	38.40
Cleveland	29.00	38.50
Chicago	26.00	29.50

SHOP MATERIALS AND SUPPLIES



ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 11.50

	—In Casks—		— Broken Lots —	
	Current	One Year Ago	Current	One Year Ago
Cleveland	14.50	18.75	15.00	21.50
New York	13.50	17.00	14.00	20.25
Chicago	15.00	22.00	15.00	21.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	10.25	9.50–10.50
Chicago	10.50	10.00
Cleveland	11.75	11.625

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	— New York —		—Cleveland—		
	Current	One Year Ago	Current	One Year Ago	Chicago
Copper, heavy and crucible	18.50	18.00	18.50	21.00	18.00
Copper, heavy and wire	16.50	17.00	19.00	21.00	17.50
Copper, light and bottoms	14.50	15.00	15.50	19.00	to 25
Lead, heavy	7.25	5.00	6.50	6.00	7.25
Lead, tea	5.25	4.00	4.50	5.00	6.00
Brass, heavy	9.50	9.50	14.00	14.50	18.00
Brass, light	8.00	8.50	10.50	11.50	10.50
No. 1 yellow brass turnings	9.50	10.00	11.00	13.50	11.25
Zinc	5.00	5.00	5.00	5.50	7.00

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00c.	34.00c.@35.00c.	33½c.

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	34.00	40.00
Chicago	29.00	40.00
Cleveland	32.00	33.50

BABBITT METAL—Warehouse price per pound:

	—New York—		—Cleveland—		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	95.00	68.50	93.00	70.00	96.00
Commercial	50.00	50.00	17.25	23.00	15.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	— New York —		— Cleveland —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	List	.80	$1.00	$1.25	$1.45	.98
Hot pressed hexagon	List	.80	1.00	1.05	1.45	.78
Cold punched hexagon	List	2.50	1.00	.75	1.05	1.00
Cold punched square	List	2.50	1.00	.75	1.05	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	70–5%	50–10%
Chicago	50%	50%
Cleveland	60–10%	50–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	30%	50%	35–5%
Larger and longer up to 1½ in. by 30 in.	20%	40%	25–5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York ..... $1.50 Cleveland ..... $3.75 Chicago $3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York ..... $7.00 Cleveland ..... $3.75 Chicago $4.25

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	25%	40–5%	30%
Larger and longer up to 1 in. by 30 in.	15%	37½%	20%

COPPER RIVETS AND BURS sell at the following rate from warehouse.:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	30%	List plus 10%	30%	List plus 10%
Chicago	10%	List price	10%	List plus 20%
New York	10%	15% from list	10%	List plus 5%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅜ and smaller	40%	55% off	45%
Tinned	40%	55% off	45%

Boiler, ¾, ⅞, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.00 Cleveland...$4.00 Chicago....$4.97 Pittsburgh...$4.72

Structural, same sizes:

New York...$5.10 Cleveland...$4.10 Chicago....$5.07 Pittsburgh....$4.82

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	33.50	36.00	35.00
Brass	32.00	34.00	34.00

For immediate stock shipment 3c. is usually added. The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 2c.; for lots of less than 75 lb., but not less than 50 lb., advance is 5c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 10c. should be added to base price; quantities from 10-25 lb., extra is 25c.; less than 10 lb., add 35c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ⅛-1½ in., inclusive, in square and hexagon—a varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

COTTON WASTE—The following prices are in cents per pound:

	NEW YORK			
	Current	One Year Ago	Cleveland	Chicago
White	13.00	11.00–13.00	14.00	11.00 to 14.00
Colored mixed	9.00 to 12.00	8.50–12.00	11.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	52.00	58.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$2.25	$2.25	$1.75
Philadelphia	2.00	2.00	1.75
Cleveland	2.50	2.50	2.625
Chicago	2.00	2.00	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.40	$3.40	$3.65
Cleveland	4.625	3.875	4.25
Chicago	4.12½	4.125	4.50

COKE—The following are prices per net ton at ovens, Connellsville:

	Jan. 15	Jan. 2	Dec. 9	Dec. 2
Prompt furnace	$6.00	$6.00	$6.00	$6.50
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	— New York —		— Chicago —	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.80	$1.59	$1.98	$1.90
5-gal. cans	2.00	1.84	2.23	2.00

WHITE AND RED LEAD—Base price per pound:

	Red				White	
	Current		One Year Ago		Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100 lb. keg	14.50	15.50	14.00	15.50	14.50	14.00
25 and 50-lb. kegs	14.75	15.75	14.25	15.75	14.75	14.25
12½-lb. keg	15.00	16.00	14.50	16.00	15.00	14.50
5-lb. cans	....	17.50	.....	.....	16.50	16.00
1-lb. cans	....	18.50	.....	.....	17.50	17.00

500 lb. lots less 10% discount. 2000 lb. lots less 10–2½% discout.

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The Bridgeport Screw Co., Union Ave., is having plans prepared by Fletcher-Thompson Co., Inc., Engrs., 1089 Broad St., for the construction of a 1 story, 50 x 100 ft. and a 2 story, 60 x 150 ft. factory, on Central Ave., for the manufacture of wire. Estimated cost, $100,000.

Conn., Bridgeport—City is having plans prepared by Davis & Dane, Archts., 1024 Main St., for the construction of a 1 story, 130 x 180 ft. garage and storage house, on Madison Ave. Estimated cost, $100,000.

Conn., Hartford—Bd. Water Comrs., Main St., plans to build a 2 story garage. Estimated cost, $25,000. R. F. Barker, 43 Ann St., Archt.

Conn., Hartford—The Hart & Hegeman Mfg. Co., 342 Capitol Ave., is having plans prepared by Greenwood & Noerr, Archts., 847 Main St., for the construction of a 4 story, 52 x 181 ft. addition to its factory, for the manufacture of electric switches. Estimated cost, $150,000.

Conn., Hartford—The Hartford Automobile Club Garage Co., 36 Pearl St., is having plans prepared by C. F. Luce, Archt., 36 Pearl St., for the construction of a 7 story, 150 x 150 ft. garage, on Hicks and South Ann Sts. Estimated cost, $500,000.

Conn., Manchester—The Williams & Stephens Automobile Co., 361 Center St., will soon award the contract for the construction of a 1 story, 78 x 100 ft. garage, on East Center St. Estimated cost, $35,000. A. E. Fiske, Johnson Block, Archt.

Conn., New London—The Standard Garage Co., 41 Golden St., will soon award the contract for the construction of a 4 story, 65 x 75 ft. garage. Estimated cost, $50,000. L. H. Goddard, 86 State St., Archt.

Conn., Oakville—The Autoyre Co. will soon award the contract for the construction of a 4 story, 60 x 140 ft. factory, and a 1 story, 60 x 150 ft. factory, for the manufacture of wire goods. Estimated cost, $200,000 and $20,000 respectively. Fletcher-Thompson Co., Inc., 1980 Broad St., Bridgeport, Archts.

Conn., Stonington—R. M. Delagrance has awarded the contract for the construction of a 1 story, 55 x 130 ft. garage. Estimated cost, $18,000.

Me., Portland—U. A. Towle, 121-131 Forest Ave., has awarded the contract for the construction of a 1 story garage. Estimated cost, $30,000.

Mass., Boston—The U. S. Dept. of Post Offices, Washington, D. C., plans to build a 2 story garage. J. A. Wetmore, c/o U. S. Treasury Dept., Washington, Supervising Archt.

Mass., Dorcester (Boston P. O.)—S. Simmons, 2 Mascoma St., Roxbury, will build a 1 story, 50 x 180 ft. garage, on Dorcester Ave.

Mass., East Springfield—F. F. Storms, 50 Spruceland Ave., Springfield, plans to build a 1 story forge plant, on Roberts Rd., here. Estimated cost, $25,000.

Mass., Everett (Boston P. O.)—The Cameron Appliance Co., 48 Waters Ave., has awarded the contract for the construction of a 1 story, 40 x 180 ft. factory, on Elmway, for the manufacture of electric appliances. Estimated cost, $30,000.

Mass., Fall River—Keogh's Storage Warehouse Co., 555 Davol St., has awarded the contract for the construction of a 1 story garage. Estimated cost, $30,000.

Mass., Gloucester—The General Electric Co., Lynn, plans to build a plant, here. D. W. Weed, executive secy.

Mass., Holyoke—The Century Machine Co., manufacturer of dish washing machines, has awarded the contract for the construction of a 2 story, 50 x 90 ft. and a 1 story, 150 x 150 ft. factory, on Main St. Estimated cost, $150,000.

Mass., Holyoke—The Magna Automobile Co., 2 Division St., plans to build a garage, on Northampton St. Estimated cost, $75,000.

Mass., North Abington—L. A. Crossett, Inc., 58 Lincoln St., Boston, has awarded the contract for the construction of a 1 story, 40 x 80 ft. garage.

Mass., Springfield—The Moore Drop Forging Co., 38 Water St., will soon award the contract for the construction of a 1 story, 50 x 60 ft. factory. Estimated cost, $25,000.

Mass., Taunton—The General Electric Co., Weir St., has awarded the contract for the construction of a 1 story, 100 x 200 ft. factory, for the manufacture of leather goods. Estimated cost, $70,000.

Mass., Whitinsville—The Whitins Machine Wks. is having plans prepared by J. D. Leland, Archt., 185 Devonshire St., Boston, for the construction of a 5 story, 90 x 400 ft. addition to its factory, for the manufacture of cotton machinery.

Mass., Worcester—The Curtis Marble Machine Co., 72 Cambridge St., is having plans prepared by Lockwood Greene & Co., Engrs., 60 Federal St., Boston, for the construction of a 3 story, 75 x 85 ft. factory, for the manufacture of cotton machinery. Estimated cost, $45,000.

R. I., Pawtucket—L. B. Fogarty, 348 Central Ave., plans to build a 2 story, 70 x 100 ft. garage, on Broadway. Estimated cost, $35,000.

R. I., Pawtucket—The W. H. Haskell Mfg. Co., Main St., has awarded the contract for the construction of a 2 story, 80 x 160 ft. machine shop. Estimated cost, $100,000.

R. I., Providence—J. H. Higgins, 198 Globe St., is having plans prepared by Page & Page, Archts., 87 Weybosset St., for the construction of a 2 story, 64 x 245 ft. garage, on Broadway.

MIDDLE ATLANTIC STATES

Md., Westport (Baltimore P. O.)—McNamara Bros., Kloman St., has awarded the contract for the construction of a 1 story, 80 x 200 ft. factory, for the manufacture of tanks and boilers. Estimated cost, $50,000.

N. J., Elmora—The American Type Founders Co., Communipaw Ave., Jersey City, plans to build a 1 story, 200 x 2,300 ft. factory. A. Nelson, Pres.

N. J., Jersey City—City plans to purchase a site on Bright St. and build a machine shop and building to take care of its engines. Estimated cost, $50,000.

N. J., Trenton—The American Bridge Co., Warren St., plans to improve plant, to include a 200 x 600 ft. main building, a 60 x 225 ft. pattern shop, a 40 x 40 ft. hospital, and an addition to its forge building. Estimated cost, $1,500,000.

N. J., Trenton—The Crescent Insulated Wire and Coil Co., Taylor St., has had plans prepared by J. O. Hunt, Archt., 114 North Montgomery St., for the construction of a 1 story, 50 x 125 ft. factory. Estimated cost, $40,000.

N. J., Trenton—The Mercer Motors Co., Whitehead's Rd., will soon award the contract for the construction of a 1, 2, and 3 story, 60 x 400 ft. factory, on Whitehead Rd., for the manufacture of automobile bodies. Estimated cost, $200,000. Day & Zimmerman, 611 Chestnut St., Philadelphia, Pa., Archt.

N. J., Trenton—The Packard Motor Car Co., 103 South Clinton Ave., has awarded the contract for the construction of a 1 story, 115 x 200 ft. factory, on Brunswick Ave. Estimated cost, $60,000.

N. Y., Coney Island—S. Rosenberg, c/o S. Millman, Archt., 26 Court St., Brooklyn, will build a 1 story, 80 x 100 ft. garage, on Neptune Ave. and 21st St. Estimated cost, $25,000.

N. Y., New York (Borough of Bronx)—The 163rd St. Garage Corp., 1411 Grand Blvd. and Concourse, will build a 1 story, 100 x 160 ft. garage, on 163rd St. and Washington Ave. Estimated cost, $50,000. M. Rothbart, Pres.

N. Y., New York (Borough of Brooklyn)—L. Gold, 44 Court St., will build a garage, on 55th St. and 10th Ave. Estimated cost, $100,000.

N. Y., New York (Borough of Brooklyn)—J. Hauben, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 99 x 100 ft. and 100 x 120 ft. garage, on Fulton St. and Highland Ave. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—F. Kantor, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 100 x 150 ft. garage, on Junius St. between Pitkin and Blake Aves. Estimated cost, $25,000.

N. Y., New York (Borough of Brooklyn)—J. Scholl, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 100 x 150 ft. garage, on Bedford Ave. and Montgomery St. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—M. Stone, 358 Kosciusko St., will build a 4 story garage, at 156 East 53rd St. Estimated cost, $75,000.

N. Y., New York (Borough of Brooklyn)—J. Wilson, c/o S. Millman, Archt., 26 Court St., will build a 1 story, 100 x 100 ft. garage, on 19th St. and 10th Ave. Estimated cost, $35,000.

N. Y., New York (Borough of Manhattan)—M. Brand & Sons, 874 1st Ave., is having plans prepared by McCabe & Blagge, Archts., 952 Main St., Bridgeport, Conn., for the construction of a 2 story, 75 x 100 ft. factory and garage, on 1st Ave. and 48th St. Estimated cost, $75,000.

N. Y., New York (Borough of Manhattan)—The East 32nd St. Garage Corp., 874 6th Ave., will build a 2 story, 90 x 96 ft. garage, at 145-151 East 32nd St. Estimated cost, $50,000.

N. Y., New York (Borough of Manhattan)—Park & Tilford, 529 West 42nd St., will build a 2 story, 75 x 100 ft. garage, at 537 West 43rd St. Estimated cost, $60,000.

N. Y., New York (Borough of Manhattan)—R. A. Stewart & Co., Inc., 201 Broadway, manufacturer of metal and rubber stamps, will build a 25 x 78 ft. factory and storehouse, at 80 Duane St. Estimated cost, $45,000.

N. Y., New York (Borough of Queens)—L. Gold, 44 Court St., Brooklyn, will build a 1 story, 100 x 200 ft. garage, on Jackson Ave., between 21st and 22nd Sts. Estimated cost, $65,000.

N. Y., New York (Borough of Queens)—The Standard Steel Car Co., 1920 Broadway, New York City, has awarded the contract for the construction of a 4 story, 90,000 sq.ft. garage and service station, on South Cane St. between William and Ely Aves. Estimated cost, $150,000.

N. Y., Poughkeepsie—The Federal Bearings Co., Inc., Fairview St., has awarded the contract for the construction of a 3 story factory.

N. Y., Rochester—J. Austice & Co., 220 North Water St., manufacturer of hardware, plans to build a factory and foundry on Humboldt St. Estimated cost, $75,000. G. M. Wolfe, Archt.

N. Y., Schenectady—The General Electric Co., River Rd., has purchased a 200 x 795 ft. building on Leighton, Crouch, and Atlantic Aves., and plans to alter and use same for manufacture of small engines.

Penn., Clark Summitt—The Connell & Erben Body Co. plans to build a 2 story, 40 x 110 ft. factory, for the manufacture of automobile bodies. Estimated cost, $50,000.

Penn., Holmesburg (Philadelphia P. O.)—The Bessemer Motor Truck Co. will soon award the contract for the construction of a 1 and 2 story, 90 x 400 ft. and 40 x 100 ft. factory. L. B. Rothchild, 1225 Sanson St., Philadelphia, Archt.

Penn., Overbrook (Philadelphia P. O.)—M. Wood has awarded the contract for the construction of a 3 story, 65 x 100 ft. garage. Estimated cost, $30,000.

Penn., Philadelphia—C. E. Dearnley Bros., Main St., has awarded the contract for the construction of a 3 story, 80 x 225 ft. worsted factory, on Baynton and Chelton Sts. Estimated cost, $90,000.

Penn., Philadelphia—The Hotel Brotherhood of the U. S. A., c/o A. C. Borzner, Archt., 717 Walnut St., will soon award the contract for the construction of a 2 story, 67 x 120 ft. garage and hall, on Bainbridge and 16th Sts. Estimated cost, $32,000.

Penn., Philadelphia—A. Spear, 715 South 3rd St., plans to build a 2 story, 55 x 60 ft. and a 35 x 42 ft. garage. Estimated cost, $10,000.

Penn., Philadelphia—The Wiccaco Machine Screw Co., 7th and Wood Sts., has awarded the contract for the construction of a 2 and 3 story, 47 x 82 ft. and 82 x 274 ft. factory and office building, on Louden and Steenton Sts.

Penn., Scranton—City plans to build a 3 story, 110 x 110 ft. high school, on Wyoming Ave., to include a lunch room, laundry, printing and sheet metal department. Estimated cost, $278,700.

Penn., Scranton—City plans to build a 3 story, 260 x 300 ft. school, on Mulberry St., to include an auditorium, gymnasium, and a manual training department. Estimated cost, $546,200.

SOUTHERN STATES

Ga., Atlanta—The White Automobile Co., East 79th St. and St. Clair Ave., Cleveland, Ohio, has awarded the contract for the construction of a 1 and 2 story garage and display room, here. Estimated cost, $150,000. W. T. White, Pres.

Tenn., Memphis—The Menges Motor Truck Co., Goodwyn Institute, will soon award the contract for the construction of a factory. Estimated cost, $150,000. G. C. Wallace, Memphis, Archt.

W. Va., Fairmont—The West Virginia Metal Products Co. has awarded the contract for the construction of a 1 story, 280 x 360 ft. factory, for the manufacture of brass and copper. Estimated cost, $2,000,000.

MIDDLE WEST

Ill., Clearing (Chicago P. O.)—The Superior Oven Co., c/o L. B. Beardslee & Co., 38 South Dearborn St., Chicago, has purchased 50,000 sq.ft. of land on 66th St. and 57th Ave., here, and plans to build a factory.

Ill., Moline—The Rock Island Mfg. Co., 1st St. and 14th Ave., manufacturer of vises, etc., has awarded the contract for the construction of a 1 story, 80 x 120 ft. addition to its foundry, on 1st St. and 7th Ave. Estimated cost, $12,000.

Ill., Rock Island—The Rock Island Register Co., 25th St. and 5th Ave., is having plans prepared by Cervin & Horn, Archts., 310 Safety Bldg., for the construction of a 3 story, 73 x 115 ft. factory. Estimated cost, $75,000.

Ind., Ft. Wayne—The Dudlo Mfg. Co., Wall St., manufacturer of insulated wire, is constructing a 1 story building, also a 2 story addition to its plant. Total estimated cost, $100,000.

Ind., Ft. Wayne—The General Electric Co., Broadway, is building a 150 x 200 ft. addition to its plant. Estimated cost, $125,000.

Ind., Ft. Wayne—The Pennsylvania R.R. is building 2 car repair shops, an office building and store room and a paint and oil storage building, here. Estimated cost, $700,000.

Ind., Ft. Wayne—The Tokheim Oil Tank and Pump Co. plans to construct a tank building.

Ind., Ft. Wayne—The Wayne Oil Tank and Pump Co., Canal St., plans to build an addition to its plant.

Mich., Detroit—The Bemb-Robinson Co., Jefferson Ave., E., will soon award the contract for the construction of a 3 story, 100 x 120 ft. garage, on Congress Ave. Estimated cost, $90,000. Baxter, O'Dell & Halpin, 1024 Hammond Bldg., Archts.

Mich., Detroit—R. H. Fyfe, Woodward Ave., has awarded the contract for the construction of a 2 story, 40 x 150 ft. garage and sales station. Estimated cost, $160,000.

Mich., Detroit—The Hudson Motor Car Co., 2901 East Jefferson Ave., has awarded the contract for the construction of a 4 story, 82 x 584 ft. automobile assembling plant.

Mich., Detroit—The Kahn Realty Co., Marquette Bldg., has awarded the contract for the construction of a 2 story, 143 x 184 ft. garage, on Cass Ave.

Mich., Detroit—J. Wynne, 821 Ford Bldg., will build a 2 story, 60 x 140 ft. garage, on Roosevelt St. Estimated cost, $30,000.

Mich., Muskegon—The Superior Sealing Co., Getty Ave., plans to build a 3 story, 100 x 320 ft. factory, on Getty and Dale Aves. Estimated cost, $250,000.

Mich., Vassar—The J. G. Green Foundry Co. has awarded the contract for the construction of a 1 story, 60 x 160 ft. foundry. Estimated cost, $30,000.

O., Cincinnati—The Vocalstyle Music Co., East 6th St., plans to build a 3½ story, 102 x 216 ft. factory, on Springfield Pike. Estimated cost, $200,000. B. De Camp, 701 Gerke Bldg., Archt.

O., Cleveland—The American Stove Co., 4415 Perkins Ave., will build a 3 story, 55 x 160 ft. factory, estimated cost, $75,000; also a 3 story, 60 x 160 ft. warehouse, at 4400 Hough Ave., cost $60,000, and a 3 story, 60 x 120 ft. factory, at 1787 East 40th St., cost, $60,000. W. J. Carter, Illuminating Bldg., Archt.

O., Cleveland—The Cleveland Railway Co., Leader-News Bldg., is having preliminary plans prepared by D. Morrow, Archt. and Engr., 4500 Euclid Ave., for the construction of a 2 story, 52 x 122 ft. operating station, on West 117th St. and Lorain Ave. Estimated cost, $250,000.

O., Cleveland—The Cleveland Rubber Mold and Machine Co., East 17th St. and Euclid Ave., has awarded the contract for the construction of a 1 story factory, on Warner Rd. Estimated cost, $200,000. J. Fairfield, Mgr.

O., Cleveland—The Cleveland Welding Machine Co., West 117th St. and Berea Rd., will soon award the contract for the construction of a 1 story, 42 x 106 ft. blacksmith shop and welding room. Estimated cost, $50,000.

O., Cleveland—The Collamer Machine Co., 1214 East 152nd St., has awarded the contract for the construction of a 1 story, 40 x 40 ft. machine shop, at 1528 Collamer Ave. Estimated cost, $8,000.

O., Cleveland—G. J. Eckerk, Permanent Bldg., will construct a 1 and 2 story, 40 x 130 ft. garage and store building, at 9706 Euclid Ave. Estimated cost, $50,000.

O., Cleveland—The Freeman Motor Co., Union Bldg., plans to build a 1 story factory, on the West Side. Estimated cost, $75,000. J. H. Albrecht, Mgr.

O., Cleveland—The Westinghouse Electric Mfg. Co., West 54th St., will build a 1 story, 128 x 165 ft. addition to its foundry, at 1228 West 48th St. Estimated cost, $50,000.

O., Columbus—The Columbus Heating and Ventilating Co., 425 West Town St., has awarded the contract for the construction of a 2 story, 100 x 120 ft. factory. Estimated cost, $35,000.

O., Salem—The Mullens Body Co. has awarded the contract for the construction of a factory, for the manufacture of automobile bodies. Estimated cost, $500,000.

Wis., Milwaukee—The Nash Sales Co., 455 Broadway, plans to build a 4 story, 120 x 190 ft. garage and salesroom. Estimated cost, $100,000.

Wis., Sheboygan—The Harold & Globe Mfg. Co., 821 Pennsylvania Ave., has awarded the contract for the construction of a 2 story, 48 x 120 ft. foundry and cupola building, on Erie Ave. Estimated cost, $60,000.

WEST OF THE MISSISSIPPI

Ia., Des Moines—The Pittsburgh Des Moines Steel Co., 9th and Tuttle Sts., is building a 135 x 300 ft. plant, for the fabrication of structural steel. Estimated cost, $100,000.

Mo., St. Louis—The Century Electric Co., 19th and Pine Sts., has awarded the contract for the construction of a factory. Estimated cost, $500,000.

Mo., St. Louis—E. D. Hunkins, 4044 Washington Ave., will build a 1 story, 50 x 244 ft. garage and repair shop, at 3628 Washington St. Estimated cost, $32,000.

Mo., St. Louis—The Hussman Refrigerator Co., 911 North Broadway, has awarded the contract for the construction of a 2 story, 129 x 260 ft. factory, at 2405-11 North Leffingwell St. Estimated cost, $90,000. Noted Jan. 16, 1919.

Neb., Omaha—The Nebraska Telephone Co., 19th and Douglas Sts., has awarded the contract for the construction of a 1 story, 105 x 132 ft. garage and a 3 story, 100 x 150 ft. warehouse, on 43rd and Cumings Sts. Estimated cost, $400,000.

WESTERN STATES

Cal., Fresno—L. S. Cobb & Co., c/o R. F. Felchin & Co., Lowell Bldg., has awarded the contract for the construction of a 2 story, 75 x 150 ft. garage, on Tuolumne and Van Ness Aves.

Cal., Fruitvale—The State Highway Comn., Forum Bldg., Sacramento, has awarded the contract for the construction of a 1 story, 90 x 120 ft. machine shop, here. Estimated cost, $20,000.

Cal., Los Angeles—Buttress & McClellan, 205 North Los Angeles St., has awarded the contract for the construction of a 1 story, 90 x 400 ft. machinery factory. Estimated cost, $70,000.

Cal., Los Angeles—J. F. Lucey Mfg. Co., 1515 East 7th St., manufacturer of oil well machinery and supplies, plans to build a factory. Estimated cost, $250,000. F. L. Feisthamel, Mgr.

Cal., Porterville—The Ulmer Machinery Co. has awarded the contract for the construction of a 1 story, 110 x 120 ft. machine shop. Estimated cost, $25,000.

Cal., Riverside—F. Miller, Mission Inn Hotel, has had plans prepared by A. B. Benton, Archt., 114 North Spring St., Los Angeles, for the construction of a 3 story, 50 x 50 ft. addition to his hotel, to contain garage, laundry and helps' quarters.

Cal., San Francisco—The Schwabacher Frey Co., 2nd and Market Sts., plans to build a 5 story printing plant, on 3rd and Bryant Sts.

Ore., Pendleton—The Umatilla Motor Sales Corp. plans to build a 2 story, 100 x 150 ft. garage, 45 x 85 ft. display room and a 30 x 90 ft shop, on College and Court Sts. Estimated cost, $60,000. O. E. Holdman, Pres.

Utah, Salt Lake City—The Taylor Motor Car Co., 127 South State St., will soon award the contract for the construction of a 2 story, 50 x 100 ft. garage, on East 1st St. Estimated cost, $55,000. Milley, Woolez & Evans, McIngre Bldg., Archts.

Wash., Seattle—The Lake Union Foundry Co., 1703 Westlake St., N., is having plans prepared for a 1 story, 40 x 70 ft. addition to its foundry. Estimated cost, $9,000. W. B. Erskine, 1109 Summit Ave., Archt.

CANADA

B. C., Vancouver—The Britannia Wire Co., manufacturer of wire cable and rope, will soon award the contract for the construction of a 2 story, 120 x 200 ft. factory, on Industrial Island. Estimated cost, $100,000.

B. C., Victoria—The Canadian Natl. Rys., Ottawa, Ont., has awarded the contract for the construction of a machine shop, round house, etc., here. Estimated cost, $30,000.

N. B., Moncton—Davis & Jones plan to build a 2 story, 50 x 75 ft. packing house. Estimated cost, $30,000.

Ont., Brampton—The Universal Batteries Co., Ltd., has awarded the contract for the construction of a 3 story, 30 x 60 ft. factory. Estimated cost, $25,000.

Ont., Toronto—The Murry Printing Co., 9 Jordan St., has awarded the contract for the construction of a 4 story, 80 x 140 ft. printing shop. Estimated cost, $135,000.

Ont., Windsor—The Burroughs Adding Machine Co., 10 Chatham St., E., manufacturer of adding machines, is having plans prepared by A. Kahn, Archt., Marquette Bldg., Detroit, Mich., for the construction of a factory. Estimated cost, $250,000.

General Manufacturing

NEW ENGLAND STATES

Conn., South Norwalk—The Dayner Realty Co., c/o J. C. Schaeffler, Archt. and Engr., 40 West 32nd St., plans to build a 4 story, 40 x 120 ft. addition to its factory, on Day St., for the manufacture of shoes.

Me., Springvale—The T. G. Plant Co. plans to build a factory, here, for the manufacture of shoes. W. J. McGaffee.

Mass., Everett—The Reliable Shoe and Slipper Co., 117 Friend St., Boston, will soon award the contract for the construction of a 1 story, 50 x 150 ft. factory, on Broadway. Estimated cost, $30,000. Burk & Bottomley, 34 School St., Boston, Achts.

Mass., Holyoke—The American Writing Paper Co., 9 Main St., will build a 1 story, 90 x 92 ft. addition to its factory. Estimated cost, $25,000.

Mass., Lowell—The Lowell Weaving Co., manufacturer of wool cloth, has awarded the contract for the construction of a 3 and 4 story, 142 x 394 ft. spinning mill, a 7 story, 90 x 120 ft. storehouse, and a 1 story, 45 x 90 ft. power house. Estimated cost, $1,000,000.

Mass., New Bedford—The Beacon Mfg. Co., manufacturer of blankets, has awarded the contract for the construction of a 1 story, 240 x 400 ft. addition to cording building and a 1 story, 133 x 318 ft. addition to weave shed. Estimated cost, $300,000.

R. I., Phenix—The Phenix Lace Mills has awarded the contract for the construction of a 1 story, 60 x 120 ft. addition to its mill. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—The Rice Baking Co., 318-24 North Gay St., has awarded the contract for the construction of a 3 story, 25 x 88 ft. addition to its bakery. Estimated cost, $50,000.

Md., Curtis Bay (Baltimore P. O.)—The Union Acid Wks. has acquired a 7 acre site, adjoining the Standard Acid Wks., and plans to build two, 150 x 600 ft. plants, 200 tons daily capacity. Estimated cost, $1,000,000.

Md., Frederick—C. E. Cline, 10-12 Market St., will build a 2 story, 50 x 150 ft. factory, for the manufacture of hosiery.

N. J., Harrison—The Driver-Harris Co., manufacturer of michrone products, c/o Lockwood-Greene Co., Archts and Engrs., 101 Park Ave., New York City, has awarded the contract for the construction of a 3 story, 50 x 100 ft. factory, on Middlesex St.

N. J., Hoboken—H. R. Mallinson & Co., Woolsley Ave., Long Island City, will soon award the contract for the construction of a factory, for the manufacture of silk. Estimated cost, $200,000. Lockwood-Greene Co., 101 Park Ave., New York City, Archts.

N. J., Trenton—The Original Trenton Cracker Co., 15 South Stockton St., W., is having plans prepared by Fowler & Seaman, Archts., 317 Broad St., for the construction of a 1 story, 97 x 105 ft. factory, for the manufacture of crackers. Estimated cost, $60,000.

N. Y., College Point (Flushing P. O.)—The J. B. Kleinert Rubber Co., 725 Broadway, New York City, will soon award the contract for the construction of a 4 story factory. Estimated cost, $150,000. R. G. Cory, 39 Cortlandt St., New York City, Archt.

N. Y., New York (Borough of Brooklyn)—The Bemis Bros. Bag Co., c/o Lockwood-Greene Co., Archts., 101 Park Ave., New York City, will soon award the contract for the construction of a 3 story, 175 x 200 ft. factory, on 51st and 52nd Sts. and 2nd Ave. Estimated cost, $500,000.

N. Y., Rochester—The Eastman Kodak Co., 343 State St., plans to make extensive alterations to plant. Estimated cost, $4,000,000. Plans include a 3 story factory, 400 ft. long, to cost, $425,000.

N. Y., Rochester—The Kellogg Mfg. Co., 3 Circle St., manufacturer of air compressors and power pumps, plans to build a factory, on Humboldt St. Estimated cost, $125,000. G. M. Wolfe, Archt.

N. Y., Rochester—The Star Egg Carrier and Tray Mfg. Co., 1037 Jay St., plans to build a factory. Estimated cost, $20,000.

Penn., Duryea—The Bloomsburg Silk Co., c/o Lockwood-Greene Co., Archts., 101 Park Ave., New York City, has awarded the contract for the construction of a 2 story, 50 x 100 ft. mill. Estimated cost, $35,000.

Penn., Easton—The Individual Drinking Cup Co., 220 West 19th St., New York City, manufacturer of "Dixie" paper cups, has awarded the contract for the construction of a 3 story, 80 x 300 ft. factory, here. Estimated cost, $300,000.

Penn., Kingston—A. E. Fromberg Bros., Passaic, N. J., plan to build a 2 story, 50 x 90 ft. silk mill, on Slocum St., here. Estimated cost, $90,000. D. A. Morgan, Connel Bldg., Scranton, Archt.

Penn., Olyphant—The Mid Valley Silk Co. is having plans prepared by G. Wescott, 119 Wyoming Ave., for the construction of a 2 story, 70 x 150 ft. mill, on Main St. Estimated cost, $40,000.

Penn., Palmerton—The Read & Lovett Mfg. Co., Weatherly, is preparing plans for the construction of a 1 story, 50 x 130 ft. silk mill. Estimated cost, $60,000.

Penn., Philadelphia—The Kraan Furniture Co., 6th and Master Sts., has had plans prepared by C. E. Schermerhorn, Archt., 430 Walnut St., for the construction of a 3 story, 30 x 77 ft. factory. Cost to exceed, $10,000.

Penn., Philadelphia—J. T. Lewis & Bros., Lafayette Bldg., manufacturer of paint and lead colors, has awarded the contract for the construction of a 1 story, 120 x 150 ft. factory, on Aromingo Ave. and Cumberland St. Estimated cost, $100,000.

Penn., Scranton—The H. G. Smith Wagon Co., Vine St., plans to build a 2 story, 90 x 160 ft. factory, on Walnut St. and Wyoming Ave., for the manufacture of wagon bodies and wheels. Estimated cost, $90,000.

Penn., Wilkes-Barre—The Diamond Drug Co. is preparing plans for the construction of a 3 story, 22 x 180 ft. factory, on Northampton St. Estimated cost, $170,000.

SOUTHERN STATES

N. C., Gartonia—C. B. Armstrong and others plan to build a yarn mill, on York Rd. Estimated cost, $200,000.

N. C., Greensboro—The Blue Bell Overall Co. has awarded the contract for the construction of a 2 story, 60 x 235 ft. factory. Estimated cost, $125,000.

N. C., Mt. Holly—The Alsace Mfg. Co. has purchased the Old Mount Holly plant and plans to make extensive alterations and build addition to same, for the manufacture of yarn. Estimated cost, $50,000.

S. C., Columbia—The Peerless Bldg. Co. will construct a 2 story, 50 x 130 ft. garage and display room. Estimated cost, $15,000.

S. C., Darlington—The Darlington Building Co. will soon award the contract for the construction of a 2 story, 100 x 200 ft. factory, for the manufacture of tobacco, and a 1 story machine and boiler house. J. L. Perkins, Secy. and Treas.

S. C., Winnsboro—The Winnsboro Mills is having plans prepared by Lockwood-Greene Co., Archts. and Engrs., State St., Boston, for the construction of a 3 story, 120 x 720 ft. weave mill.

Tenn., Memphis—The Item Biscuit Co., 1202-24 Capitol Ave., Omaha, Neb., will soon award the contract for the construction of a 6 story, 292 x 450 ft. factory, on Florida St., near Carolina Ave. Estimated cost, $500,000.

MIDDLE WEST

Ill., Chicago—The Chicago Coated Board Co., 11 South La Salle St., plans to build a factory, on Cottage Grove Ave. and 138th St. Estimated cost, $3,000,000.

Ill., Chicago—W. E. Dee & Co., 30 North La Salle St., manufacturer of building materials and sewer tile, has acquired 40,000 sq.ft. of land on Normal Ave. and 37th St. and plans to build a factory.

Ind., Ft. Wayne—The Virginia Carolina Chemical Co., Taylor St., is building a 2 story, 141 x 912 ft. building.

Mich., Detroit—The Sibley Lumber Co., Kercheval and Beaufait Aves., has awarded the contract for the construction of a 3 story, 157 x 160 ft. factory. Estimated cost, $100,000.

Mich., Grand Rapids—The Kent Fuel Co., 1230 Taylor Ave., has awarded the contract for the construction of a 75 x 320 ft. coal dock and loading station.

Mich., Saginaw—The Saginaw Table and Cabinet Co., Wheeler St., has awarded the contract for the construction of a 2 story, 62 x 234 ft. and a 61 x 112 ft. factory, for the manufacture of furniture. Estimated cost, $125,000.

O., Cincinnati—The Cincinnati Shaper Co., Elam and Garrard Sts., has awarded the contract for the construction of a 2 story, 90 x 236 ft. addition to its factory. Estimated cost, $75,000.

Wis., Marshfield—The Farmers Barn Equipment Co., Two Rivers, plans to build a 3 story, 60 x 250 ft. factory, here. Estimated cost, $50,000.

Wis., Milwaukee—The Jewett & Sherman Co., 287 Broadway, has purchased a 6 story building on Florida St., and plans to remodel same and install new equipment for the manufacture of coffee and spices. Estimated cost, $100,000.

Wis., Sheboygan—The Badger State Tanning Co., South Water St., is having plans prepared by Juul & Smith, Archts., Imig Bldg., for the construction of a 4 story, 60 x 250 ft. tannery. Estimated cost, between $50,000 and $60,000.

Wis., Sheboygan — The Sheboygan Coaster Wagon Wks., North 9th St., has awarded the contract for the construction of a 4 story, 60 x 110 ft. factory. Estimated cost, $20,000.

WEST OF THE MISSISSIPPI

Ia., Sioux City—The Leeds Grain Belt Cereal Co. plans to build a 6 story, 50 x 120 ft. mill. Estimated cost, $200,000.

Kan., Wichita—The Sinclair Refining Co., 111 West Washington St., Chicago, Ill., has had plans prepared for the construction of a 2 story, 55 x 180 ft. factory, a 1 story, 30 x 80 ft. machine shop and a 1 story, 30 x 80 ft. garage. Estimated cost, $230,000.

Mo., St. Louis—J. D. Howe, 5811 De Giverville St., has purchased a site on Natural Bridge Rd., and plans to build a 3 story, 117 x 250 ft. factory, for the manufacture of patent medicine. Estimated cost, $20,000.

Mo., St. Louis—The National Lead Co., 5500 Manchester St., has awarded the contract for the construction of a 1 story, 47 x 57 ft. furnace room. Estimated cost, $25,000.

Neb., Alliance—The Alliance Packing Co. plans to build a packing plant. Estimated cost, $75,000. R. E. Plum, Pres.

Tex., Dallas—The Campbell-Stone Bread Co., 30th and Troost Sts., Kansas City, Mo., has awarded the contract for the construction of a 2 story, 69 x 119 ft. bakery. Estimated cost, $125,000.

Tex., Ft. Worth—The Invincible Oil Corp., 208 West 8th St., plans to build a 5,000 bbl. capacity refinery, in northern section of city. Estimated cost, $500,000.

Tex., San Antonio—J. Courand, 212 Alamo Natl. Bank Bldg., will soon award the contract for the construction of a 2 story, 89 x 106 ft. service station, at Alamo Plaza and Crockett St. Estimated cost, $50,000.

WESTERN STATES

Cal., Eureka—The California Central Creameries, 3rd and B Sts., has had plans prepared by H. J. Brunner, Engr., Sharon Bldg., San Francisco, for the construction of a 1 and 2 story, 110 x 240 ft. cheese curing warehouse and office building, here. Estimated cost, $80,000.

Cal., Gridley—Libby, McNeill and Libby, 38 South Dearborn St., Chicago, has had plans prepared by W. J. Milier, Archt., 417 Market St., San Francisco, for the construction of a 1 story, 160 x 660 ft. cannery. Estimated cost, $335,000.

Cal., Hanford—The California Prune and Apricot Growers' Association, Market and San Antonio Sts., San Jose, has had plans prepared by Wallace & Bush, Engrs., Bank of San Jose Bldg., San Jose, for the construction of a packing plant, here. T. S. Montgomery, Pres.

Cal., Los Angeles—The Los Angeles Creamery Co., 1120 Towne Ave., plans to build a 1 story, 50 x 250 ft. garage, at 12th St. and Towne Ave.

Cal., Los Angeles—The Mathews Paint Co., 219 South Los Angeles St., has awarded the contract for the construction of a 2 story, 99 x 99 ft. factory, on San Fernando Rd. Estimated cost, $40,000.

Cal., Napa—The California Prune and Apricot Growers' Association, Market and San Antonio Sts., San Jose, has had plans prepared by Wallace & Bush, Engrs., Bank of San Jose Bldg., San Jose, for the construction of a packing plant, here. T. S. Montgomery, Pres.

Cal., Santa Paula—The California Prune and Apricot Growers' Association, Market and San Antonio Sts., San Jose, has had plans prepared by Wallace & Bush, Engrs., Bank of San Jose Bldg., San Jose, for the construction of a packing plant, here. T. S. Montgomery, Pres.

Cal., Sunnyvale—The California Prune and Apricot Growers' Association, Market and San Antonio Sts., San Jose, has had plans prepared by Wallace & Bush, Engrs., Bank of San Jose Bldg., San Jose, for the construction of a packing plant, here. T. S. Montgomery, Pres.

Cal., Visalia—The California Prune and Apricot Growers' Association, Market and San Antonio Sts., San Jose, has had plans prepared by Wallace & Bush, Engrs., Bank of San Jose Bldg., San Jose, for the construction of a packing plant, here. T. S. Montgomery, Pres.

Ore., Eugene—The Mutual Creamery Co., 551 West 3rd St., Salt Lake City, Utah, plans to build a 2 story cheese factory and condensed milk plant, here. Estimated cost, $50,000. A. Jensen, Vice Pres.

Ore., Klamath Falls — The Associated Lumber and Box Co. plans to build a 1 story box factory and planing mill. Estimated cost, $25,000.

Ore., Portland—The Aladdin Co., 607 Yeon Bldg., manufacturer of sectional houses, has purchased the plant of the Stay-Round Silo Co. in Peninsula manufacturing district, and will also build a 2 story, 125 x 400 ft. factory. Estimated cost, $50,000.

Ore., Portland—The American Can Co., Failing Bldg., has acquired an 8 acre site, on 26th and Wilson Sts., and plans to build a 2 or 3 story factory. Estimated cost, $1,000,000. F. P. Kendall, Mgr.

Ore., Portland—The Sterrett Packing Co., Kenton St., has purchased a 15 acre site, adjoining the Pacific International Livestock Association, and is building a plant, fitted for curing, packing, killing and manufacturing meat by-products, etc. Estimated cost, $500,000. J. L. Sterrett, Pres.

Utah, Salt Lake City—The Sweet Candy Co., 2241 1st St., has awarded the contract for the construction of a 5 story, 75 x 120 ft. factory, on 2nd St., W. Estimated cost, $150,000.

Wash., Aberdeen—The Bishop Lumber Co., Montesano, plans to build a 2 story, saw-mill, on harbor frontage, here, to have 60,000 ft. daily capacity. Estimated cost, $100,000. E. K. Bishop, Mgr.

Wash., Olympia—The Olympia Door Co. plans to build a 2 story sash and door factory, adjoining present plant, 150,000 ft. daily capacity. Estimated cost $25,000.

CANADA

N. B., Milltown—The Canadian Cotton Co., Ltd., plans to build a 1 story, 186 x 410 ft. weaving factory. Estimated cost, $50,000.

Ont., Peterboro—The Canadian Aladdin Co., Canadian Pacific R. R. Bldg., Toronto, plans to build a 3 story, 60 x 80 ft. electric light factory, here. Estimated cost $75,000.

Ont., Toronto—The Dunlop Tire and Rubber Goods Co., 224 Booth Ave., has awarded the contract for the construction of a 6 story factory. Estimated cost, $250,000.

Que., Chambly—The Bennett Co., Ltd., 59 St. Henry St., Montreal, has had plans prepared by T. Pringler & Sons, Ltd., Archts., Covistine Bldg., Montreal, for the construction of a 3 story, 40 x 100 ft. factory, on River St., here, for the manufacture of shoes. Estimated cost, $150,000.

Que., St. Hyacinthe—The Manhasset Mfg. Co., 1406 Turks Head Bldg., Providence, R. I., manufacturer of tire fabrics, has awarded the contract for the construction of a factory, here. Estimated cost, $150,000.

Machine Tools Wanted

The following concerns are in the market for machinery and machine tools:

Mass., Lowell—The Lowell Weaving Co. —spinning and weaving machinery.

N. J., Gloucester—Pusey & Jones Shipbuilding Co.—machinery and machine tools.

N. J., Trenton—W. H. Baker, 450 Norway Ave.—machine shop equipment.

N. Y., Green Island (Albany P. O.)—The Sweet & Doyle Foundry and Machine Co.—24 in. pattern makers' lathe, with 8 to 12 ft. bed, hand feed, compound rest outer face plate and floor standard. (used).

N. Y., New York (Borough of Bronx)—F. Keil & Son, 401 East 163rd St.—6 x 6 in. compressor.

N. Y., New York (Borough of Brooklyn) —The Paddock Cork Co., 1209 De Kalb Ave.—general machinery.

N. Y., New York (Borough of Manhattan)—The American Spectacle Co., 47 West 34th St.—12 x 18 in. Chandler-Price press.

N. Y., New York (Borough of Manhattan)—The Champion Forging Co., 38 Church St.—53 steam drop hammers, 4 high speed hydraulic presses and 6 forging machines.

N. Y., New York (Borough of Manhattan)—The Electric Shop, 1696 Broadway —8 or 10 ft. squaring shear.

N. Y., New York (Borough of Manhattan)—L. H. Goldsall, 18 Broadway—press brakes and sheet metal working machinery.

N. Y., New York (Borough of Manhattan)—The Guerney Elevator Co., 8th Ave. and 25th St.—No. 11 Brown & Sharpe grinding machine (used).

N. Y., New York (Borough of Manhattan)—The Waterman Fountain Pen Co., 191 Broadway—drill presses.

N. Y., Watertown—The H. H. Babcock Co., Factory Sq.—emery disc grinder, 18 to 24 in. base, complete with countershaft and extra grinding disc. (new).

N. Y., Rochester—The Glazier Mfg. Co., 7 Griffiths St.—One No. 74 Consolidated press.

One No. 4 consolidated pres.

One No. 2 consolidated press.

One No. 21 consolidated press.

One No. 164-½ B. Bliss double action toggle press. (new).

N. Y., Rochester—W. H. Torne—hand tools.

Penn., Erie—The Ball Engine Co., 12th and Cranberry Sts.—36 in. new Era vertical turret lathe. (used).

Penn., Philaledphia — The Enterprise Co., 3rd and Dauphin Sts.—woodworking machinery.

Penn., Philadelphia—The Hotel Brotherhood of U. S. A., c/o A. C. Borzner, Archt., 717 Walnut St.—garage equipment.

Penn., Reading—The Reading Pattern Wks., 336 Chestnut St.—pattern making and woodworking machinery

W. Va., Fairmont — The West Virginia Metal Products Co.—machine shop equipment and rollers for the manufacture of brass.

Ill., Chicago—May & Malone, 29 East Madison St.—machinery and machine tools.

Ill., Chicago—The O'Gara Coal Co., 332 South Michigan Axe.—two 8 x 10 in. horizontal center crank steam engines. (new)

Ill., Chicago—The Sinclair Oil and Refining Co., 111 West Washington St.—machinery and machine tools.

Ill., Moline—The Rock Island Mfg., 1st St. and 14th Ave.—foundry equipment.

Ill., Rockford—The Mechanics Machine Co., 19th St.—a torsional testing machine of 200,000 lb. capacity. (used).

Ill., Rock Island—The Rock Island Register Co., 25th St. and 5th Ave.—sheet metal presses, sheet metal working machinery, polishing wheels and enameling ovens.

Ill., Rock Island—United States Government—two 72 ft. span traveling cranes.

Mich., Detroit—The Bemb-Robinson Co., 286 East Jefferson St.—small lathe and equipment for repair shop.

Mich., Detroit—R. H. Fyfe, Woodward Ave.—machine shop repair equipment.

Mich., Detroit—McMillen Mchy. Co.— machinery and machine tools.

Mich., Detroit—The Sibley Lumber Co., Kercheval and Beaufait Aves.—planing mill, morticing machines, saws, etc.

Mich., Detroit—The A. O. Smith Corp., 708 Ford St.—coining presses.

Mich., Muskegon—The Superior Sealing Co., Getty Ave.—band saws, planing mill and general wood working machinery.

Mich., Detroit—The United States Radiator Corp., 517 Dime Bank Bldg.,—⅝ in. bolt heading machiine. (used).

Mich., Grand Rapids—The Kent Fuel Co., 1230 Taylor Ave.—conveyor and loading machine.

Mich., Vassar—The J. G. Green Foundry Co.—cupolas and conveying equipment.

O., Bellaire—The Bellaire Enamel Co.—geared double crank press similar to a Bliss 4, with an 8-10-12 in. stroke, a double seamer similar to a Toledo 303 S., an engine lathe, 10 x 24 in. with taper attachment and a hydraulic boiler for 24 to 27 gal. sheet steel straps (new.)

O., Cincinnati—The Aherns Fox Fire Engine Co., Cook and Alfred Sts.—No. 70 Heald internal grinder. (used).

O., Cincinnati—The Weir Frog Co., Station H.,—rotary shear for handling up to 14 in. steel, machine with 42 in. gap motor drive. (new).

O., Cleveland — The Goodyear Tire and Rubber Co., East 21st St. and Chester St.—machinery and machine tools.

O., Cleveland — The Hydraulic Pressed Steel Co., Illuminating Bldg.—hydraulic presses for straightening axles.

O., Cleveland—The Lux Electric Fixture Co., 5217 Euclid Ave.—drilling machine, thread cutter, turning lathe, pipe cutting machine and punch press.

O., Cleveland—The Natl. Safe Co., East 69th St.,—horizontal boring mill.

O., New Philadelphia—The Wise-McClung Mfg. Co.—punch presses.

Wis., La Crosse—The Iron Products Co. bulldozer.

Wis., La Crosse—Tne McKenzie Mfg. Co. —36 in. foot power squaring shear and a stove pipe roller. (used).

Wis., Milwaukee—The Badger Packard Machinery Co., 133 West Water St.—24 or 26 in. lathe, with 12 to 16 ft. bed (new or used).

Wis., West Allis—The Rosenthal Corn Husker Co., 7403 Greenfield Ave.—90 ton punch machine and squaring shears.

Io., Cherokee—The Caswell Mfg. Co.—punch and shear similar to Badger 12½. (used).

Kan., Leavenworth—The Victor Mfg. Co., Pennsylvania and Lawrence St.—medium sized milling machine with geared arbor. (new or used).

Mo., St. Louis—The Eureka Automobile Parts Mfg. Co., 1915 Pine Ave.—machinery and machine tools.

Cal., Los Angeles—Buttress & McClellan, 205 North Los Angeles St.—traveling cranes, drill presses and lathes.

Ont., Toronto—The Harris Wood Products Co., 164 Bay St.—large nailing machine and later door manufacturing machines.

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0078